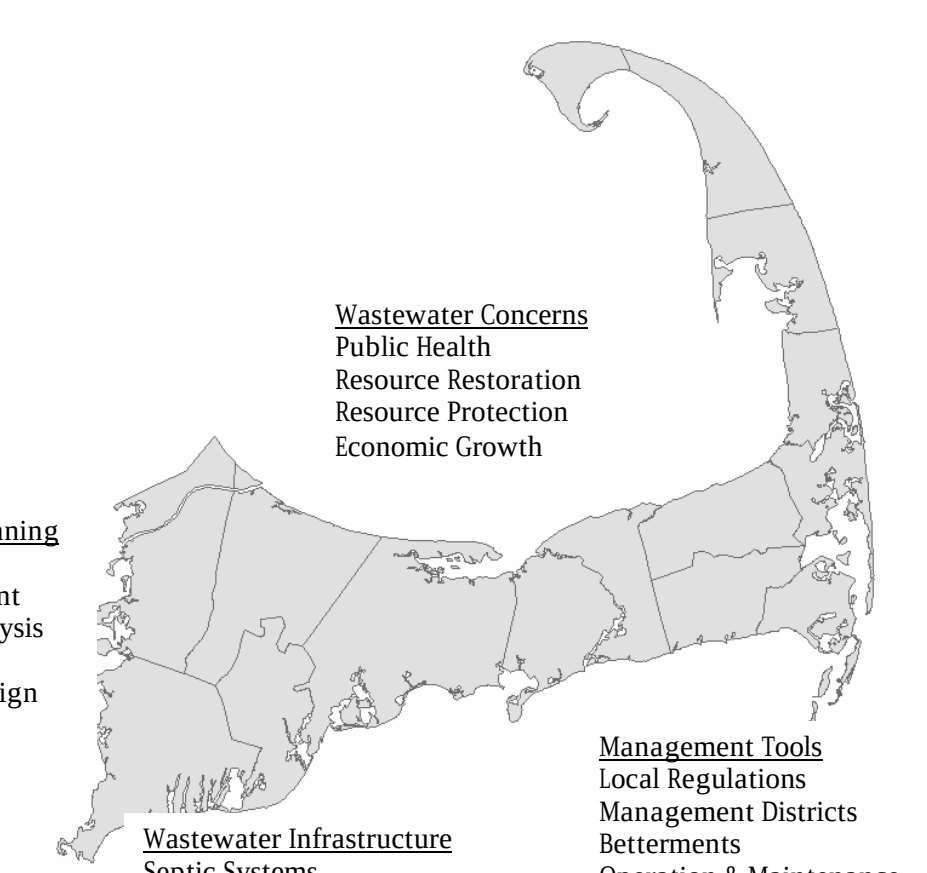
CAPE COD COMPREHENSIVE REGIONAL WASTEWATER MANAGEMENT STRATEGY DEVELOPMENT PROJECT

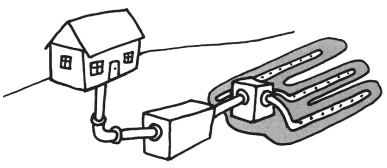
FINAL REPORT

June, 2003

Prepared by
Cape Cod Commission
Water Resources Office
Barnstable County

CAPE COD COMMISSION





Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project

June, 2003

Prepared by

CAPE COD COMMISSION

- A Department of Barnstable County -

Prepared for

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF RESOURCE PROTECTION

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Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project

Project Number 02-04/MWI

June 30, 2003

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Executive Summary

This is a Final Report of activities taken by the Cape Cod Commission under an EOEA grant entitled " Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project." The goal of this grant is to assist Cape Cod towns that are engaged in wastewater management planning and provide a regional context for wastewater management solutions. This effort will also require recognizing the need for a variety wastewater infrastructure choices and better management alternatives that will protect and restore sensitive water resources while maintaining economic sustainability.

The Barnstable County Commissioners established the Wastewater Implementation Committee (WIC) as an advisory committee to Barnstable County. The committee serves as a regional forum on wastewater issues for sharing information and coordination between towns, the county, and state programs. The exchange of information at this forum provides an opportunity to reach a regional consensus on funding, management, technology, policy and other issues related to wastewater and develop this consensus into a new regional wastewater management plan. The goal of the WIC is to address wastewater issues in a manner that incorporates good science, appropriate technologies and acceptable legal and financial means of implementation. The creation of the WIC coincided with a growing level of interest and activities in wastewater issues across Cape Cod. Among recent WIC activities are discussion of: 1) potential state legislation to generate funding for wastewater infrastructure on Cape Cod; 2) Cape Cod Commission planning and regulatory activities; 3) County Health on-site septic system technology review activities; 4) Business Round Table efforts to link Cape Cod's sustainable economic future with environmental quality; 5) the Massachusetts Estuary Project; and 6) coordination with the County Assembly of Delegates regarding Wastewater Management Reserve Fund expenditures.

In addition to creation of the WIC, Commission staff also prepared a regional assessment of wastewater planning and landuse analysis. This assessment included a number of steps. First, a matrix of local wastewater planning and concerns was prepared using input from the WIC. Second, several Geographic Information System landuse maps were created detailing sensitive water resources, threats to water resources from development and wastewater facility and discharge area concerns. Third, wastewater flow estimates were calculated for the Cape as a region, for each of the 15 towns, Zone IIs, watersheds to marine embayments and conceptual major and minor growth incentive areas. As a result of these calculations, it is estimated that the Cape annually generates approximately 12 billion gallons of wastewater. Within that total, approximately 30% is discharged into the Zone IIs of public water supply wells and over 80% is discharged into watersheds to marine embayments. Finally, wastewater estimates were prepared for eleven potential growth areas identified by town planners. Wastewater treatment estimates for these areas range between 100,000 gallons per day (gpd) and 1 million gpd with an average of 300,000 gpd. Siting wastewater treatment facilities with even these moderate treatment capacities will prove difficult due to landuse constraints, public opposition, and drinking water protection policies.

As a result of these grant activities, Barnstable County has provided an additional $55,000 to evaluate wastewater management district options for Cape Cod and to use four case studies for examples to show how such management tools can be applied. The results of this study will be available in the Fall of 2003.

Although detailed watershed and site-specific assessments will be required, this project has helped establish a regional framework to undertake important discussions about wastewater planning and outreach and to collectively seek effective solutions for wastewater problems that are common among the towns of Cape Cod.

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I. Introduction

This is a Final Report of activities undertaken by the Cape Cod Commission relative to an EOEA grant entitled " Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project." The goal of the grant project is to assist Cape Cod towns that are engaged in wastewater management planning and provide a regional context for wastewater management solutions recognizing the need for infrastructure and better management alternatives to protect and restore sensitive water resources and to maintain economic sustainability. The Task items described herein include the establishment of a new regional wastewater advisory committee, compilation of landuse and wastewater flow volumes, and efforts towards a wastewater management district case study with various legal and institutional measures. The work begun under this grant has been simultaneous with growing interest across Cape Cod for action on this topic. The completed task items described in this report will become part of new regional wastewater planning document being scoped and prepared by the Barnstable County Wastewater Implementation Committee (WIC).

II. Background

Cape Cod is a peninsula comprised of a series of broad, glacial outwash plains and hilly moraines, which are surrounded by 43 coastal embayments (Cape Cod Commission, 1998) and contains nearly 1,000 fresh water ponds (Cape Cod Commission, 2003). The Cape Cod Aquifer is one of the most productive groundwater systems in the Commonwealth. It is a Sole Source Aquifer providing drinking water to over 500,000 people (USEPA, 1982) from over 145 gravel packed municipal supply wells. The aquifer is recharged solely from rain and ultimately discharges to the surrounding embayments if not otherwise captured by wells and groundwater fed ponds (Strahler,1966)

As a result of having desirable surface water resources for recreation and aesthetics, an excellent and bountiful water supply, and being located close to major northeast urban areas, Cape Cod has experienced a rapid increase in population over the last half century; nearly a 20% growth rate over the last decade (US Census, 2000). Development on Cape Cod has been primarily residential with associated commercial, industrial and tourism-based landuses. The increase in population has brought increased need for appropriate services and infrastructure, including wastewater treatment infrastructure.

Wastewater infrastructure on Cape Cod is comprised mostly of individual on-site septic systems. Approximately 85% of the homes on Cape Cod use this form of wastewater disposal. Because of the very permeable sands that comprise Cape Cod, almost anywhere a septic system is placed, the ground readily accepts the water. To a septic system owner, this is a very affordable and low maintenance wastewater treatment option. Unfortunately, this affordability neglects the water quality costs associated with this form of treatment.

Functioning septic systems do a good job at reducing solids and protecting public health from bacteria, but they are not designed to remove contaminants such as nitrogen that pass readily into the ground (Robertson, *et al.*, 1991). Nitrogen is a compound of

particular concern because it is a public health drinking water concern as well as a fertilizer for algae in coastal waters. Too much nitrogen in coastal embayments results in water quality impacts associated with eutrophication, such as loss of shellfish beds and eelgrass.

Twenty-five years ago water planners dealt with these drinking water concerns through a strategy of wellhead protection and dilution (CCPEDC, 1978). This strategy recommended one-acre lots to provide enough dilution of septic system wastewater with percolating rain, that drinking water standards could be conservatively maintained at one-half the state and federal drinking water standard of 10 parts per million (ppm). In addition, the public embraced acquisition of land for protection for wellhead areas. These strategies for water protection were adopted and codified into local and eventually state regulations and there is general acceptance that municipal drinking water supplies have been adequately protected by these measures.

However, as a result of these policies, residential development in the last 25 years has sprawled across Cape Cod, consuming open space and dispersing wastewater throughout the aquifer. At the same time, groundwater, moving at an average rate of foot per day, carries and ultimately discharges the nitrogen from wastewater to the coast. During the 1990's, ecological impacts on Cape Cod's surrounding marine embayments were widely documented (*e.g.*, Costa, 1988, Howes, *et al.*, 1999). Wastewater from septic systems was found to be the primary source of nitrogen overloading the coastal embayments resulting in algae growth, replacement of pristine bottom environments with thick macro-algae mats, loss of shell fisheries and, at times, fish kills (*e.g.*, CCC, 1998). As a result of these efforts, it is generally accepted that in order to protect and restore marine water quality, wastewater will need to be better treated to reduce nitrogen loading (DEP, 2003). This acceptance has led to calls for improved wastewater treatment, with most of the activity focussed initially on new septic system technologies (Heufelder, 1997).

Sprawl associated with drinking water protection has also created complications for other development needs. Many Cape Cod towns are approaching buildout and with a lack of land to develop, there is a concern for future economic sustainability and competition among worthy municipal needs, such as affordable housing and drinking water supply, for use of the remaining open space.

The impacts of Cape Cod's widespread use of individual septic system has reached a point where most Cape Cod towns are actively engaged in wastewater management and water resource protection discussions (see press articles in Appendix A). However, much of these discussions have been opportunistic without comprehensive wastewater management plans and lacking in goal for attaining overall treatment improvements. The struggle for locals to tackle wastewater problems is exacerbated by a lack of funding and basic knowledge about the details of needs assessments, the financial and legal options for establishing management districts, and facility siting issues.

In order to begin to address to these needs, the Commission prepared and received funding from the EOEA for the Cape Cod Regional Comprehensive Wastewater Management Strategy Development project. This report is a summary of the activities undertaken under the EOEA grant but is also a beginning for establishing the framework for regional discussions and prioritization of solutions for the wastewater infrastructure on Cape Cod.

III. Barnstable County Wastewater Implementation Committee

In the effort to arrive at a consensus of wastewater management issues for Cape Cod, the Commission staff conceived of a regional advisory committee called the Wastewater Implementation Committee (WIC). Staff envisioned a committee engaged in activities that move wastewater issues from discussion to planning and ultimately assisting towns to construct treatment infrastructure and implement meaningful management changes.

Acting in the interest of providing regional services, the Barnstable County Commissioners took on the task of working with its Departments in establishing the Wastewater Implementation Committee. As a number of efforts converged into the WIC formation, it was decided that the Cape Cod Commission would provide the logistical support of the WIC through the EOEA grant and the Barnstable County Department of Health and the Environment would provide input on its technical programs. In January 2002, the County issued a request to the towns to provide representatives to the WIC and the first meeting of the WIC occurred on May 21, 2002. A listing of current WIC members is found in Appendix B.

The Wastewater Implementation Committee is comprised of 24 members appointed by the County Commissioners presently including representatives from:

15 Cape Cod Towns - DPW, Board of Health, or other town official
Cape Cod Commission
Barnstable County Department of Health and the Environment
Cape Cod Chamber of Commerce
Department of Environmental Protection
Waquoit Bay National Estuarine Research Reserve
Association to Preserve Cape Cod
Barnstable County Commissioners
Barnstable County Assembly of Delegates
Cape Light Compact

A. WIC Mission Statement

After several meetings, the WIC developed its mission statement and formulated its work efforts as follows:

> The Wastewater Implementation Committee is an advisory committee to Barnstable County. The committee is to serve as a regional forum on wastewater issues for sharing information and coordination between towns, the county and state programs, and providing local and regional

> input towards consensus building and developing a new regional wastewater management plan. The Wastewater Implementation Committee (or WIC) is embarking on an ambitious agenda to facilitate and encourage towns to initiate wastewater management strategies that protect public health, restore coastal and fresh surface water quality, preserve community character and provide growth center infrastructure. The WIC's goal is to address these wastewater issues in a manner that incorporates good science, appropriate technologies and acceptable legal and financial means of implementation.

The WIC has met 9 times in the year since its first meeting in May 2002. Grant activities have included: providing logistical support for Barnstable County to establish the WIC, compiling membership information, assembling email lists for its members and other interested individuals, establishing agendas, facilitating meetings, providing meeting minutes, and coordinating with other County and local officials. These activities have required an average of approximately 30 hours a month of senior staff time.

B. Initial WIC Work Tasks

The WIC brought together representatives from towns with a variety of backgrounds. While some town were fully engaged in wastewater facility planning, some were just beginning planning activities and others were not engaged beyond the normal Board of Health Title 5 reviews. The initial meetings focussed on collectively familiarizing all WIC members with the extent of activities being undertaken at all levels across the Cape. In order to facilitate this effort, the WIC developed and compiled a "matrix" of local issues and status of wastewater management planning for each town. This matrix is described in Section II and included in Appendix C.

In addition, many WIC members were unclear about the state Comprehensive Wastewater Management Planning process, the state Revolving Loan funds (SRF) and the Massachusetts Environmental Policy Act (MEPA) review. In order to increase familiarity, the WIC developed a one-page flow-chart of the current state wastewater facility planning process, which is also included in Appendix C.

Other initial WIC tasks included providing input to Commission staff on the grant-related GIS land use analysis as required under the grant as described in Section II and input to the Commission on its request for consultants to evaluate options for wastewater management districts, which is discussed in Section III.

C. Current WIC Activities

By far, the greatest benefit of the WIC is the regional coordination and information transfer of the numerous wastewater planning activities that are occurring across Cape Cod. In order to facilitate this transfer, the WIC developed a table of primary activities and responsible parties (Table 1). The table of efforts are categorized under science, legal, financial, outreach, local, regional and regulatory activities. The agenda for each

WIC meeting has a place for coordination and updates of these activities. Further explanations of these and other WIC activities are provided below.

1. Leveraging of efforts for Wastewater District Planning and Technology Assessment

Addressing the level of local and regional interest and desire for action in wastewater management issues was beyond the original scope of work of the WIC. In order to begin to address this and make up the reduced project budget originally requested for the EOEA project, the Barnstable County Commissioners and the Assembly of Delegates committed $25,000 of FY02 supplemental funds to the Cape Cod Commission for use in the Wastewater Management Districts Task 3 of the EOEA scope. The Assembly of Delegates also committed $ 70,400 to the BCDHE for providing wastewater technology assistance to the towns and for running the On-Site Septic System Technology Center located at the Massachusetts Military Reservation.

At the same time the WIC was developing its scope of work for the wastewater management districts project, the Business Round Table (BRT), through the Association to Preserve Cape Cod (APCC), was working on a similar project. This project received funding from the Barnstable County Economic Development Council (BCEDC) for use evaluating creation of a regional entity to assist towns with the financial burdens of providing wastewater infrastructure. Seeing the similarity of the studies, the WIC began to coordinate closely with the BRT and added a representative from APCC to its membership. During the coordination of these efforts, the WIC determined that the cost of their project to evaluate wastewater management districts was more than the WIC had in hand. Commission staff sought and received an additional $30,000 from the BCEDC to complete the WIC Wastewater Management District Task.

2. State Legislation

Another significant coordination issue that the WIC is working on is potential state legislation for wastewater infrastructure funding on Cape Cod. In the closing session of the State legislative session of 2002, Senator Robert O'Leary filed a piece of Legislation referred to as the "Cape Cod Water Works Commission." Senator O'Leary has characterized it as a placeholder piece of legislation to begin discussion about a regional wastewater entity to provide a combination of assistance to towns that opt to vote to join the entity and, potentially, funding for wastewater infrastructure projects through a meals tax surcharge. Senator O'Leary was responding to the identified need on Cape Cod for wastewater infrastructure and the lack of funds to address it. The Senator and his staff are working closely with the WIC and others to make sure the legislation, if pursued, would incorporate the best thinking and consensus on this issue. The Senator recognizes that the WIC is an appropriate forum for providing effective feedback on this issue and he and his staff remain in close communication.

Table 1
Wastewater Activities on Cape Cod and Responsible Parties

Science	Legal	Financial	Outreach	Local	Regional Planning	Regulatory
Massachusetts Estuaries Project - establishing nitrogen sensitivity for 89 coastal embayments	Barnstable County Wastewater Implementation Committee - RFR on legal mechanisms to establish wastewater management districts, with examples	Business Round Table - RFR for legal research to establish entity with authority to bond/cover costs of large infrastructure projects	Barnstable County Wastewater Implementation Committee Networking - meetings with opportunities to network and have regional coordination	Provincetown, Chatham, Barnstable, Mashpee, Falmouth	Wastewater Needs Assessment and Facility Siting Analysis	ENF, DEIR, FEIR Massachusetts Environmental Policy Act
SMAST, DEP, CCC	CCC	APCC - EDC	Barnstable County	In Facility Planning Process	Cape Cod Commision	EOEA
Septic Tank Test Center at MMR - testing facility for denitrifying alternative septic systems	DEP Guidance document - Legal framework and available options, including districts, for management wastewater and nutrients	State Revolving Loan Fund for Wastewater	Waquoit Bay NERR Wastewater Materials - outreach materials including books, workshops, fact sheets on wastewater management districts and alternative septic systems	Harwich, Orleans, Yarmouth, Eastham	Regional Infrastructure and Facility Plan	Groundwater discharge permits, sewer extensions, Innovative/ Alternative On-site
BCDHE	DEP	DEP		Towns with active wastewater committees	Cape Cod Commission	DEP
Regional Innovative/Alternative Data Base Training System Performance and Maintenance		Community Septic Management Program				Development of Regional Impact Review
BCDHE		BCDHE				Cape Cod Commision
Constructed Wetlands Feasibility Study		Wastewater Reserve Fund				Local Permits
Ashumet Off-sets Committee Falmouth		Assembly of Delegates				Board of Health and Conservation Commissions

CCC - Cape Cod Commission
BCDHE - Barnstable County Department of Health and the Environment
DEP – Department of Environmental Protection
APCC - Association to Preserve Cape Cod
BRT – Business Round Table
EDC – Economic Development Council
SMAST - School of Marine Science and Technology (UMASS-Dartmouth)
EOEA - Executive Office of Environmental Affairs
ENF - Environmental Notification Form
DEIR- Draft Environmental Impact Report
FEIR - Final Environmental Impact Report
DRI - Development of Regional Impact

3. Cape Cod Commission
(www.capecodcommission.org)
The Cape Cod Commission is the regional landuse and regulatory agency for Cape Cod established by the legislature in 1989. The Commission reviews projects meeting specific regional thresholds and can approve development projects with conditions or deny them. According to its enabling legislation, local wastewater facility plans that are subject to state regulatory review requiring an Environmental Impact Report, are also subject Commission regulatory review. This means those wastewater facility plans must meet the minimum performance standards of the Barnstable County Regional Policy Plan (Cape Cod Commission, 2002). Through the course of the regulatory review, the Commission Water Resource staff provides both technical regulatory review and technical assistance.

The Cape Cod Commission is also engaged in several other activities that are associated with wastewater. One is the preparation of a Regional Infrastructure Facility Plan (RIF) that will provide a description of regional infrastructure needs of Cape Cod for the future. Although wastewater infrastructure is a major item of the plan, the RIF will also include sections on transportation, solid waste management, telecommunications and affordable housing. The goal of the RIF is to provide a comprehensive and long-term strategy for addressing the impacts of growth. Another major planning effort is the establishment of criteria and delineation of Growth Incentive Zones (GIZs). GIZs will most likely require wastewater infrastructure so this effort is linked to both the RIF and WIC efforts.

4. Barnstable County Department of Health and The Environment
(www.barnstablecountyhealth.org)
The BCDHE provides technical assistance in all public health matters to Cape Cod towns. A primary area is assisting the towns in the application of Title 5, the State Environmental Code for on-site septic systems. The BCDHE also established and operates an innovative Alternative On-site Septic System Test Center located at the Massachusetts Military Reservation. This is a unique national test center that is used to test innovative septic system from across the Country. The BCDHE also coordinates the implementation of a state subsidy program for residents for low interest loans and grant to upgrade failing septic systems.

5. Business Round Table
(www.apcc.org)
The Business Round Table (BRT) is a group of business people that are united with environmental planners in seeking mutual protection of Cape Cod's water resources, environment and quality of life in the face of sprawling development. The BRT is coordinated through the Association to Preserve Cape Cod (APCC). The BRT is working on growth control bylaws and as mentioned above, seeking solutions to the financial burdens of providing wastewater infrastructure. The BRT has hired the Conservation Law Foundation's private consulting arm, CLF Ventures, and Teal Associates to assist them in conducting their evaluation of legal options for creating a regional wastewater infrastructure entity to provide financial assistance to towns. Preliminary findings indicate that it is possible to establish a regional wastewater entity under the County Charter. This is work is being funded through a grant from the BCEDC. Results from the BRT project will discussed with the WIC.

6. The Massachusetts Estuary Project
(www.state.ma.us/dep/smerp/smerp.htm)
The Massachusetts Department of Environmental Protection (DEP) and the School of Marine Science and Technology (SMAST) at the University of Massachusetts-Dartmouth are working on a collaborative project called the Massachusetts Estuary Project (MEP). This project is designed to quantify the nitrogen sensitivity of coastal bays and estuaries in southeastern Massachusetts. Technical experts from SMAST, the Commission, the US Geological Survey and others are working with DEP to evaluate the nitrogen sensitivity through comprehensive water quality testing, quantitative TMDL (Total Maximum Daily Load) modeling, and identification of nitrogen management options within estuary watersheds. Project partners include Barnstable County, EOEA, Coastal Zone Management, and municipalities throughout of southeastern Massachusetts.

The Estuaries Project exemplifies the need for state and local authorities and stakeholders to work cooperatively to address water quality issues on a watershed-by-watershed basis. This Project will result in the generation of many technical, planning and policy guidance documents that will help to address water quality issues associated with inland surface waters and will also assist DEP and communities with a development of an effective framework for comprehensive watershed protection. The MEP provides towns with a water quality assessment method that is scientificly rigorous and approved by state, federal, and county regulatory agencies. Because of the close coordination among all these agencies, the MEP offers significant cost savings toward what it might cost a town to undertake similar work on its own. Barnstable County has provided $200,000 to the MEP over the last two years to assist Cape Cod towns in the watershed assessments that are an integral part of the investigations.

D. Regional Advisory Role
In the Fall of 2002, the Assembly of Delegates began the process to set aside funds from the County supplemental budget expressly for wastewater issues. As a result of a coordinating meeting between the Assembly of Delegates and the County Commissioners, the WIC was seen as an advisory body to assist both branches of County government. This meeting also resulted in members from each branch being assigned to the WIC, as well as a representative from the Cape Light Compact. At the same time, the WIC approved town representatives as Chair and Vice Chair to lead the previously staff-facilitated WIC. In early 2003, the Assembly of Delegates established the Wastewater Reserve Fund with $350,000 through a County Ordinance and asked the WIC to create criteria for ranking and scoring potential projects applying for these funds. At its May 2003 meeting, the WIC created a subcommittee to complete this task.

E. Barnstable County Regional Wastewater Management Planning Strategy
The WIC has had significant discussions about developing a regional wastewater management strategy document for Cape Cod. This document would provide Cape Cod with a concise status of wastewater management planning, including an environmental assessment, infrastructure needs assessment, technology assessment, and a review of regulatory processes, potential funding sources, and directions for the future. The working products and efforts being compiled through this grant, as detailed in the next few sections, will provide the some of the initial content for such a document. A draft outline of the Regional Wastewater Planning document under discussion is included in Appendix D.

IV. Regional Wastewater Analysis

In order to begin to discuss wastewater management issues on Cape Cod, a basic understanding of the regional status needs to be developed. Some towns have centralized muncipal wastewater treatment facilities and some are involved in comprehensive wastewater assessments funded through town initiatives or the State Revolving Fund (Figure 1). But a comprehensive list of the status of wastewater activities and issues on the Cape has not been compiled.

Under the EOEA grant, a major work task of the EOEA grant is the compilation of regional wastewater information. This task involved: 1) developing a matrix of the status of local wastewater planning and concerns, 2) a GIS landuse analysis, and 3) generation of wastewater flow estimates to evaluate the scope of the wastewater problem on Cape Cod. This task was conducted by the Cape Cod Commission staff, in coordination with the WIC.

A. Wastewater Matrix

Staff developed a matrix of questions and facts for each of the WIC town representatives to complete using local information. All 14 towns completed the matrix and staff compiled the information into a single two-page double sided-spreadsheet, which is included in Appendix B. Provincetown has chosen not to actively participate given that they had just completed a lengthy facility planning process. Table 2 is a summary of the town responses.

Table 2. Summary of Cape Cod Wastewater Issues and Planning Matrix

	Towns Responding	Town Responses	
Title 5 Problems	14	14	
Wastewater Management Need	9	7	
Resource Impairments			
Ponds	9	Nutrients	9
		Bacteria	6
		Monitoring	9
Embayments	8	Nutrients	7
		Bacteria	6
		Monitoring	8
Drinking Water	9	HAZMATS	3
		Monitoring	7
		Nutrients	2
		Bacteria	2
		Iron/Mn	1
		MTBE	1

	Towns Responding	Town Responses	
Advisory Committees			
Wastewater Committee	12	Yes	7
Water Quality Committee	12	Yes	8
Water Sampling Committee	12	Yes	9
Wastewater Facilities			
Existing Facility	14	Yes	8
Town Subsidized	5	Yes	5
Enterprise Account	4	Yes	4
District	5	Yes	4
Operator	7	Private	2
Ongoing Facility Planning	14	Yes	6
Citizens Advisory Committee	14	Yes	7
Consultants	5		
Stearns and Wheler	3		
Camp Dresser and McKee	1		
Wright-Pierce	1		

NOTE: Responses based on responses from WIC representatives

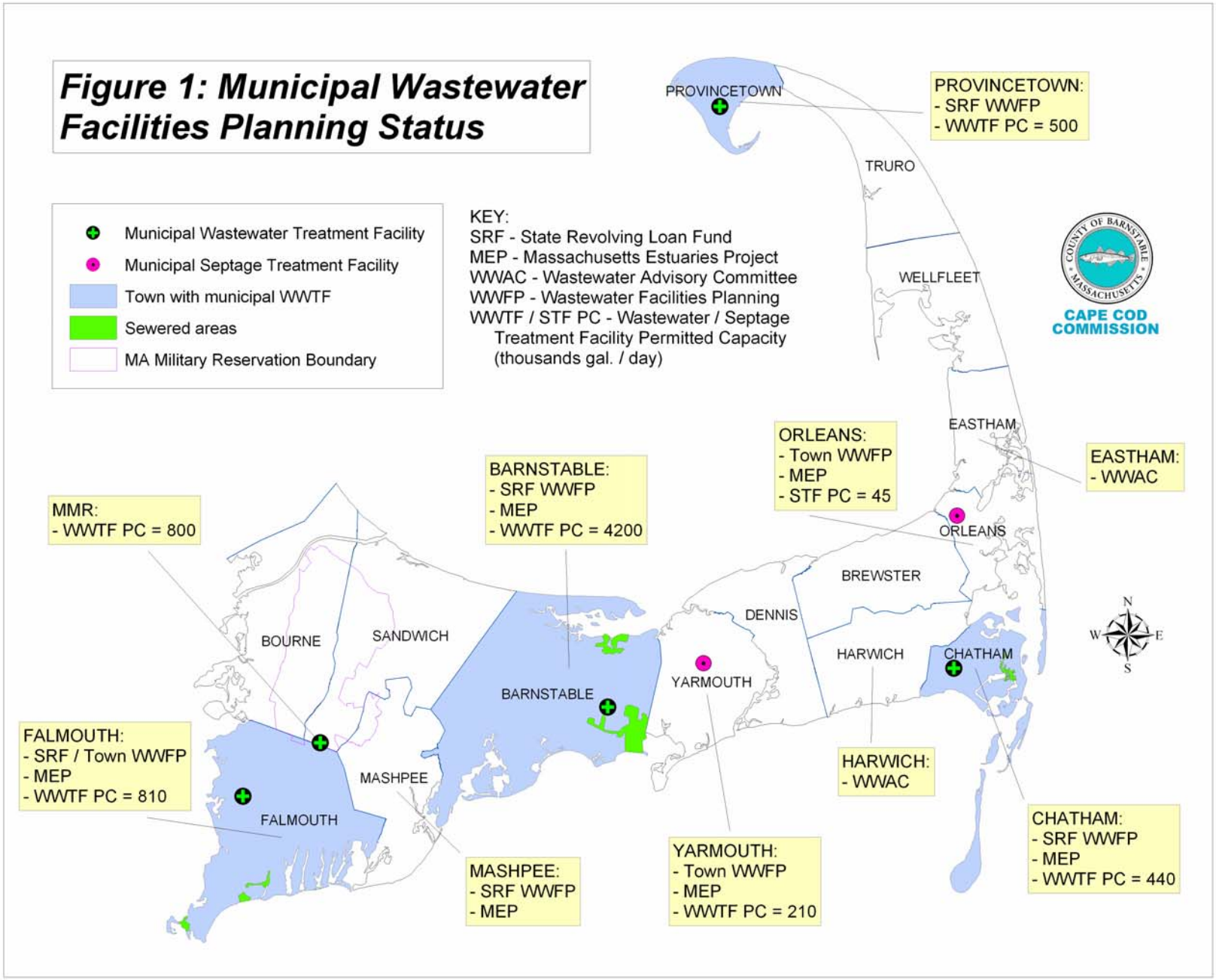
Figure 1: Municipal Wastewater Facilities Planning Status
Municipal Wastewater Treatment Facility
Municipal Septage Treatment Facility
Town with municipal WWTF
Sewered areas
MA Military Reservation Boundary
KEY:
SRF - State Revolving Loan Fund
MEP - Massachusetts Estuaries Project
WWAC - Wastewater Advisory Committee
WWFP - Wastewater Facilities Planning
WWTF / STF PC - Wastewater / Septage Treatment Facility Permitted Capacity (thousands gal. / day)
CAPE COD COMMISSION
PROVINCETOWN
PROVINCETOWN:
- SRF WWFP
- WWTF PC = 500
TRURO
WELLFLEET
EASTHAM
EASTHAM:
- WWAC
ORLEANS:
- Town WWFP
- MEP
- STF PC = 45
ORLEANS
BREWSTER
DENNIS
HARWICH
CHATHAM
HARWICH:
- WWAC
CHATHAM:
- SRF WWFP
- MEP
- WWTF PC = 440
YARMOUTH
YARMOUTH:
- Town WWFP
- MEP
- WWTF PC = 210
BARNSTABLE:
- SRF WWFP
- MEP
- WWTF PC = 4200
BARNSTABLE
MMR:
- WWTF PC = 800
BOURNE
SANDWICH
MASHPEE
MASHPEE:
- SRF WWFP
- MEP
FALMOUTH:
- SRF / Town WWFP
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The responses on the matrix indicate that all of the towns responding have problems with on-site septic systems and half indicated an immediate need for wastewater management solutions. Responses show that nutrient impacts on surface waters is a primary concern and that most towns have responded to this concern by instituting some water quality monitoring. Results show that there are more concerns with nutrients than bacteria. The most frequent drinking water concern is the contamination by hazardous materials. Of the 14 towns responding, six have on-going facilities planning and seven have a citizens advisory committee. Of the 12 towns responding to questions on advisory committees, seven have wastewater committees, eight have a water quality committee and nine had water quality monitoring committees.

B. Land use Analysis

Understanding the distribution of wastewater sources, needs, and impacted resources requires organization of significant information. Cape Cod Commission staff used the GIS system to complete three specific research objectives as follows:

- *Objective 1* → Identify lakes, ponds, rivers, embayments, public water supply wells, their watersheds, and their sensitivity to wastewater contaminants.
- *Objective 2* → Review available projections of wastewater flows from densely developed areas and economic growth centers with the potential to impact regional water resources.
- *Objective 3* → Identify and review criteria for the location of new wastewater facilities / disposal areas that would serve "need" areas.

The following are descriptions of each of the maps followed by a regional wastewater flow estimates and a discussion of the findings. Detailed map descriptions including source GIS coverages are included in Appendix F and digital copies of the maps are available from the Cape Cod Commission upon request.

1. Water Resources of Cape Cod

Figure 2 identifies the lakes, ponds, rivers, embayments, and public supply wells of Cape Cod, as well as their watersheds. This map shows a combination of information from Cape Cod Water Resources Classification Maps I and II, which were adopted as a part of the Cape Cod Regional Policy Plan (RPP) on April 29, 2002. The focus of this map is the Primary Resource Areas, or watershed to these resources, which have specific regulatory protections under the RPP. Primary Resource Areas include: Wellhead Protection Areas, Freshwater Recharge Areas, Potential Public Supply Areas, and Marine Water Recharge Areas.

2. Threats to Water Resources from Development

Figure 3 highlights residential density in areas by displaying them in using an increasing color gradient; darker colors denote higher residential density. Regional commercial and industrial centers are also visible. Given the predominant use of on-site septic systems, areas of higher density are generally also areas of higher wastewater flows. Other sites directly impacting regional groundwater quality are also displayed; these include: wastewater treatment facilities, waste disposal and hazardous waste sites, and state-registered (DEP) groundwater discharge permit sites. Estimated groundwater pollution plumes from a portion of these sites are also displayed.

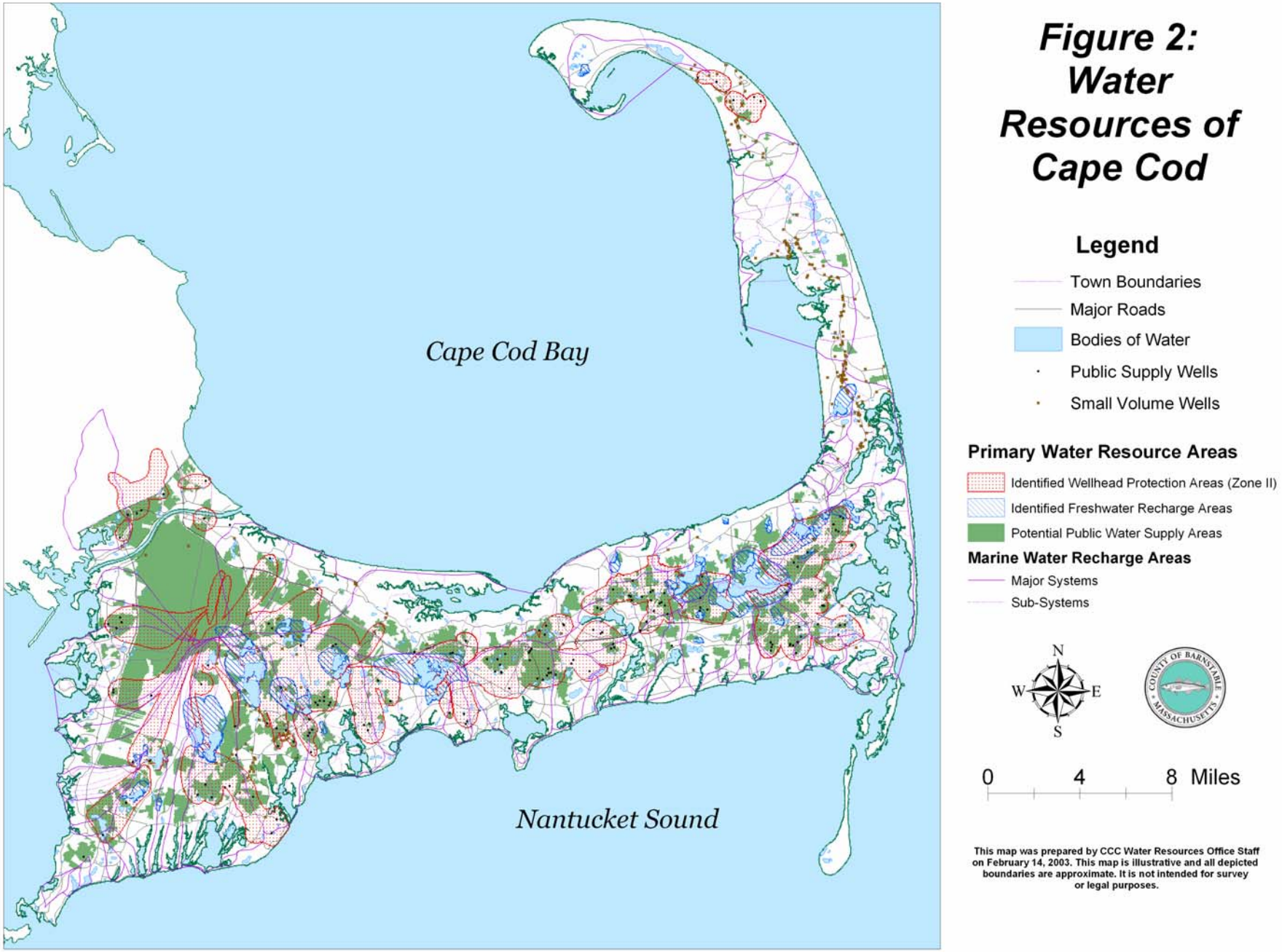

Figure 2: Water Resources of Cape Cod

Legend

- Town Boundaries
- Major Roads
- Bodies of Water
- Public Supply Wells
- Small Volume Wells

Primary Water Resource Areas

- Identified Wellhead Protection Areas (Zone II)
- Identified Freshwater Recharge Areas
- Potential Public Water Supply Areas

Marine Water Recharge Areas

- Major Systems
- Sub-Systems

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This map was prepared by CCC Water Resources Office Staff on February 14, 2003. This map is illustrative and all depicted boundaries are approximate. It is not intended for survey or legal purposes.

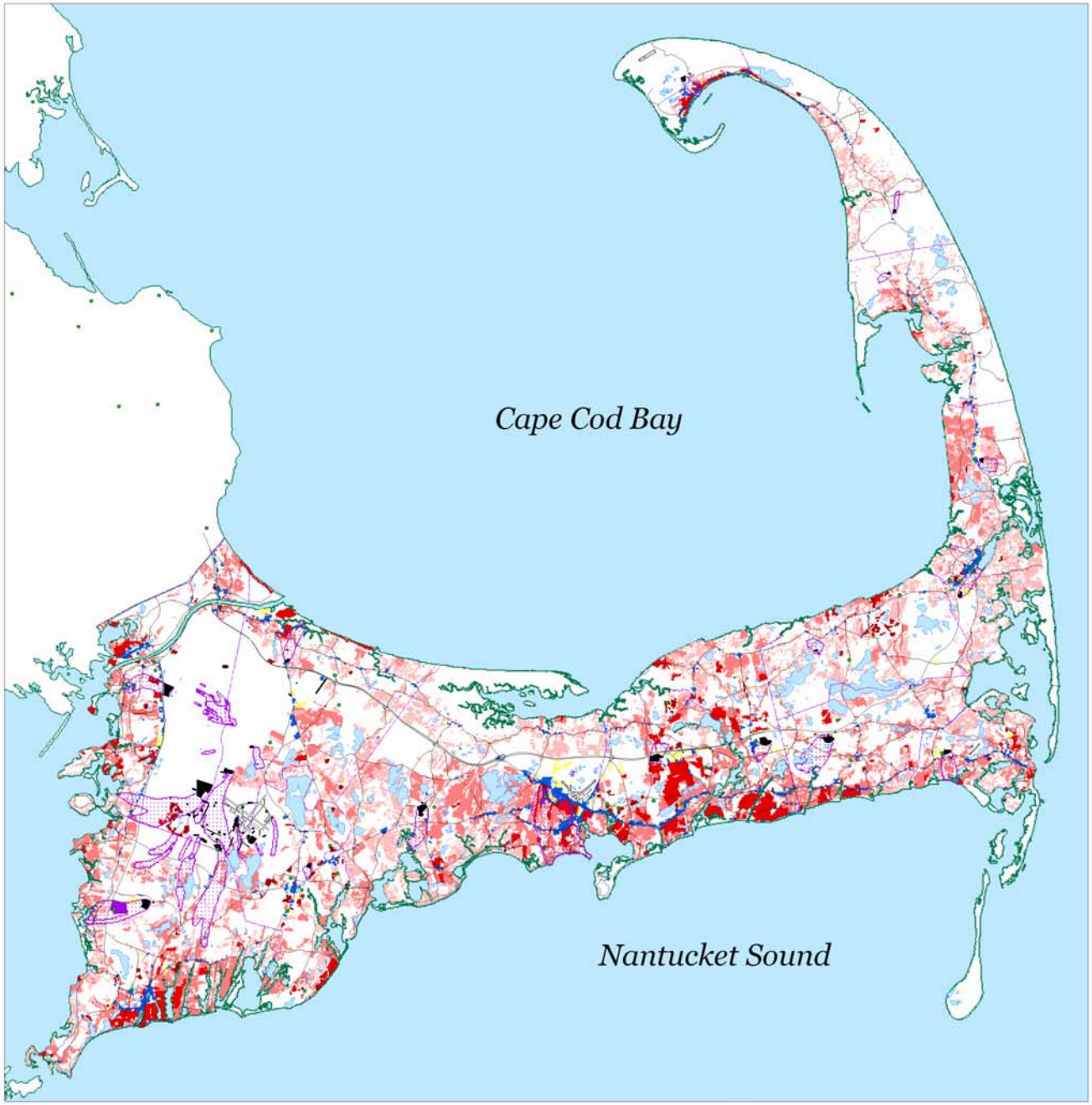

Figure 3: Threats to Water Resources From Development

Legend

- Major Roads
- Town Boundaries
- Bodies of Water
- Wastewater Treatment Facilities
- Waste Disposal / Hazardous Waste Sites
- Suspected Groundwater Pollution Plumes
- Groundwater Discharge Permit Sites

Land Use

- Multi-Family Residential
- High Density Residential
- Medium Density Residential
- Low Density Residential
- Commercial
- Industrial

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This map was prepared by CCC Water Resources Office Staff on February 14, 2003. This map is illustrative and all depicted boundaries are approximate. It is not intended for survey or legal purposes.

3. Wastewater Facility / Disposal Area Concerns

A significant issue for any project or town facility plan is finding a suitable location for wastewater treatment and effluent disposal that 1) meets regulatory requirements to protect water resources and 2) is also acceptable to the public. Given the rapid pace of development on Cape Cod, there is keen competition for undeveloped land. This competition makes it increasingly difficult to site wastewater facilities, especially larger treatment systems.

Under this grant, the Commission was tasked with developing a regional assessment of potential sites for wastewater treatment and disposal. This task involved the development of landuse screening criteria and preparation of a regional GIS map (Figure 4). This map was developed to target regional and local issues associated with siting moderate to large wastewater facilities only; local siting decisions will require additional analysis.

In order to prepare Figure 4, a landuse screening method was used that is similar to the method used by the US Geological Survey during their identification of potential public water supply areas (USGS, 1994). As a first step, a number of landuse classes were identified by the Commission water staff that would typically preclude the development of a new wastewater treatment facility (WWTF) or discharge area. Next, data layers that reflect each of the identified landuses were sequentially overlaid. The order of overlays is generally based on the regional extent of each of the coverages; larger coverages were applied first. The display order is as follows.

- Protected and recreational open space
- Wetlands
- The Massachusetts Military Reservation Water Supply Reserve
- The Cape Cod National Seashore
- Existing residential areas
- Existing wastewater treatment facilities
- 400 ft. buffer regions of public drinking water supply wells
- 300 ft. buffer regions of small volume wells (in order to identify them)
- outlines of wellhead protection areas

This overlay procedure sequentially eliminated areas from consideration as future wastewater facilities / disposal areas. Areas remaining after all overlays were applied (in white) are areas that may be suitable for the location of wastewater facilities. Please note that at this time, this map represents an initial screening and does not constitute the formal scientific review required of individual sites nor the political opinion of the WIC.

The single biggest identified issue is that the majority of the suitable areas are located within the Wellhead Protection Areas to public water supply wells. This is a major issue for Cape Cod because of wastewater in these areas will eventually impact the public water supplies. Existing DEP Wellhead Protection Regulations (310 CMR 22) and RPP minimum performance standards do not prohibit large wastewater facilities in Zone IIs, but the RPP only allows their use in these areas for the restoration of water quality.

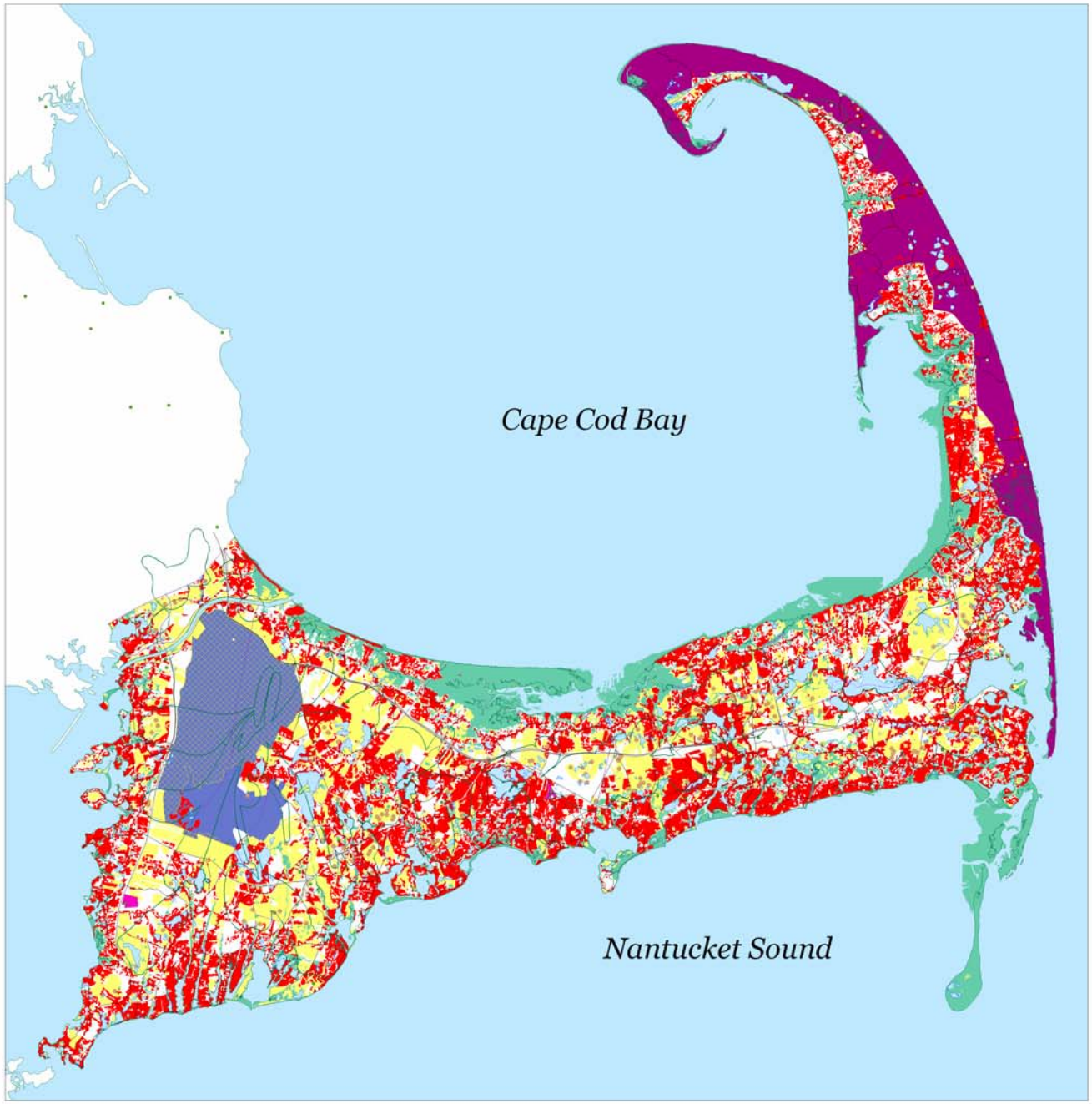

Figure 4: Wastewater Facility and Discharge Area Concerns

Legend

- Cape Shoreline
- Major Roads
- Town Boundaries
- Bodies of Water
- Groundwater Discharge Permit Sites
- Identified Wellhead Protection Areas (Zone II)
- 300 ft. buffer of Small Volume Wells
- 400 ft. buffer of Public Supply Wells (Zone 1)
- Wastewater Treatment Facilities
- Residential Areas
- Cape Cod National Seashore
- MMR Groundwater Protection Zone
- Massachusetts Military Reservation
- Wetlands
- Protected and Recreational Open Space

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This map was prepared by CCC Water Resources Office Staff on February 12, 2003. This map is illustrative and all depicted boundaries are approximate. It is not intended for survey or legal purposes.

The WIC discussed wastewater siting issues and the use of the Figure 4 map at length and concluded that although this analysis is appropriate for regional reviews and may be helpful as a starting point for local discussions, local facility siting requires significantly more detailed review of individual sites and extensive public discussion. These local reviews would address a number of issues. First, siting a facility depends on having the need for collection and treatment. If there is a public acceptance of the need for a wastewater facility, then siting can focus on technical issues related to choosing a location. Second, scale is an important consideration. Since nearly every residential lot contains a wastewater treatment system (on-site septic system), developing a local understanding of the scale of system, or systems, associated with addressing wastewater needs is an important step. Third, discharge of the treated effluent can be addressed in a number of different ways. Distribution of the effluent to multiple discharge sites can reduce the need for large land areas and use of various discharge technologies, such as well injection or subsurface discharge galleries can also further reduce land area needs.

These WIC discussions led to other issues related to state regulatory policies and available analysis tools. For instance, use of well injection into the aquifer will most likely require some anti-bacterial agent so that iron fouling by subsurface bacteria does not cause significant clogging and maintenance problems. However, putting agents such as chlorine in wastewater discharges in Zone II has been an issue where DEP has been hesitant to make new policy. Discussion of this issue led to an associate issue of the method for delineating Zone IIs and how that may impact facility and discharge siting decisions. Recent groundwater modeling results by the US Geological Survey show that Zones of Contribution (ZOCs) to public supply wells are smaller subsets of the Zone IIs (USGS, 2000). Given the increasing scarcity of undeveloped land, this raises issues about impacts of effluent discharges on these ZOCs and Zone IIs, as well as the need for such a modeling tool for evaluation of future wastewater discharge siting. The WIC endorsed an effort to have this modeling tool available to evaluate siting issues at both a regional and local scale.

C. Regional Wastewater Estimates for Cape Cod

Part of beginning to understand the extent of the wastewater problem on Cape Cod is knowing how much wastewater is being generated on both a regional and town-wide basis. The EOEA grant originally included a regional analysis of wastewater volume estimates for areas thought to be likely to require sewers and to identify where wastewater from these areas would most likely could be treated and disposed. However, while working with the WIC, it became clear that this particular task was far too detailed and would need significantly more local input and information than could be obtained under the available funding. Such tasks are typically conducted through wastewater facility plans needs assessments. In order to begin to understand the scope of the issues, staff did produce regional and town estimates of wastewater volumes, as well as percentages captured by Wellhead Protection Areas and coastal embayments.

In order to develop wastewater volume estimates, staff began by selecting MacConnell landuse since it is regionally consistent and simpler to use than town parcel data. Town assessors records, which are tied to town parcel data varies from town to town and often has a variety of land use categories. The MacConnell landuse categories were digitized from 1999 aerial photo interpretation by the Resource Mapping and Land Information Systems, Department of Forestry and Wildlife Management at University of Massachusetts, Amherst (1990). MacConnell categories for residential, commercial and industrial were used to estimate wastewater flow. These

landuses, particularly residential, are the primary ones generating wastewater. The coverages are the same as shown on Figure 2.

Wastewater flow estimates were made using the assumptions shown in Table 3. A discussion with town planners at a regional meeting indicated that eight units for multifamily units was a reasonable number for Cape Cod. The average occupancy for each town was computed from 2000 US Census information and these rates were used to estimate population in each town (Table 4). A flow rate of 55 gallons per day per person (based on Title 5) was used to estimate wastewater flow.

Table 3. Land use values used in Regional Wastewater Flow Estimates

MacConnnell Category	Description	Flow Factors
Multi-Family Residential		8 units / acre, town occupancy / unit, 55 gpd / person
High-Density Residential	smaller than 1/4 acre lots	3.7 units / acre, town occupancy / unit, 55 gpd / person
Medium Density Residential	1/4 to 1/2 acre lots	2 units / acre, town occupancy / unit, 55 gpd / person
Low Density Residential	larger than 1/2 acre lots	1 unit / acre, town occupancy / unit, 55 gpd / person
Commercial	general urban; shopping center	75% lot coverage, 75 gpd / 1000 sq. ft.
Industrial	light and heavy industry	75% lot coverage, 75 gpd / 1000 sq. ft.

Table 4. Town Occupancy
2000 US Census persons per unit

Barnstable	Bourne	Brewster	Chatham	Dennis	Eastham	Falmouth	Harwich
2.43	2.43	2.37	2.03	2.10	2.27	2.37	2.23
Mashpee	Orleans	Provincetown	Sandwich	Truro	Wellfleet	Yarmouth	
2.45	2.12	1.85	2.79	2.25	2.20	2.14	

These landuse to wastewater conversion assumptions are similar to assumptions that are used in a number of regional nitrogen loading estimates including: Technical Bulletin 91-001, (Eichner and Cambareri, 1992), Monomoy Lens Groundwater Protection Project (Cape Cod Commission 1994), Monomoy Capacity Study (Cape Cod Commission, 1997), Sagamore Lens Project (Cape Cod Commission, 1996), Buzzards Bay Project (1999), and Cape Cod Coastal Embayment Project (Cape Cod Commission, 1998). More detailed water use analysis completed in some of these regional assessments has found that occupancy is the critical number in estimating flows; housing occupancy varies greatly from town to town and, especially on Cape Cod, season to season. Local wastewater planning will require more refined estimates of wastewater flows, but the estimates presented below are appropriate for beginning to understand the regional scope of wastewater impacts and volumes.

Staff prepared estimates of wastewater flow for 1) each town with a total for the Barnstable County, 2) Zone IIs to Public Drinking Water Supply Wells, 3) each major coastal embayment watershed and 4) a sample of potential growth incentive zones as identified by preliminary discussions with town planners.

1. Cape-Wide and by Town

Total wastewater generation on Cape Cod is 32 million gallons per day or 12 billion gallons per year. On a town basis, estimates range from a high of 2.3 billion gallons per year for Barnstable to a low of a 0.25 billion per year for Provincetown (Table 5, Figure 5). The regional estimate compares favorably with regional public water supply estimates; public water suppliers pumped approximately 11 billion gallons in 2002 (Cape Cod Commission, 2003). Since the outer Cape towns of Eastham, Wellfleet and much of Truro do not utilize public water supply, this regional estimate appears to be appropriate.

Table 5. Regional Wastewater Flow Estimates

TOWN	Town-Wide (million gallons per year)	ZONE II (million gallons per year)	Percent of Town Wastewater in Zone IIs	Embayments (million gallons per year)	Percent of Town Wastewater to Embayments
Barnstable	2346	1293	55%	2211	94%
Bourne	1070	303	28%	468	44%
Brewster	458	86	19%	155	34%
Chatham	481	90	19%	447	93%
Dennis	974	148	15%	849	87%
Eastham	359	No PWS	No PWS	184	51%
Falmouth	1521	118	8%	1152	76%
Harwich	671	205	31%	451	67%
Mashpee	663	277	42%	606	91%
Orleans	480	18	4%	457	95%
Provincetown	218	No PWS	NO PWS	218	100%
Sandwich	939	397	42%	744	79%
Truro	207	46	22%	55	27%
Wellfleet	255	No PWS	No PWS	243	95%
Yarmouth	1393	605	43%	1290	93%
Barnstable County	12,033	3,587	30%	9532	79%

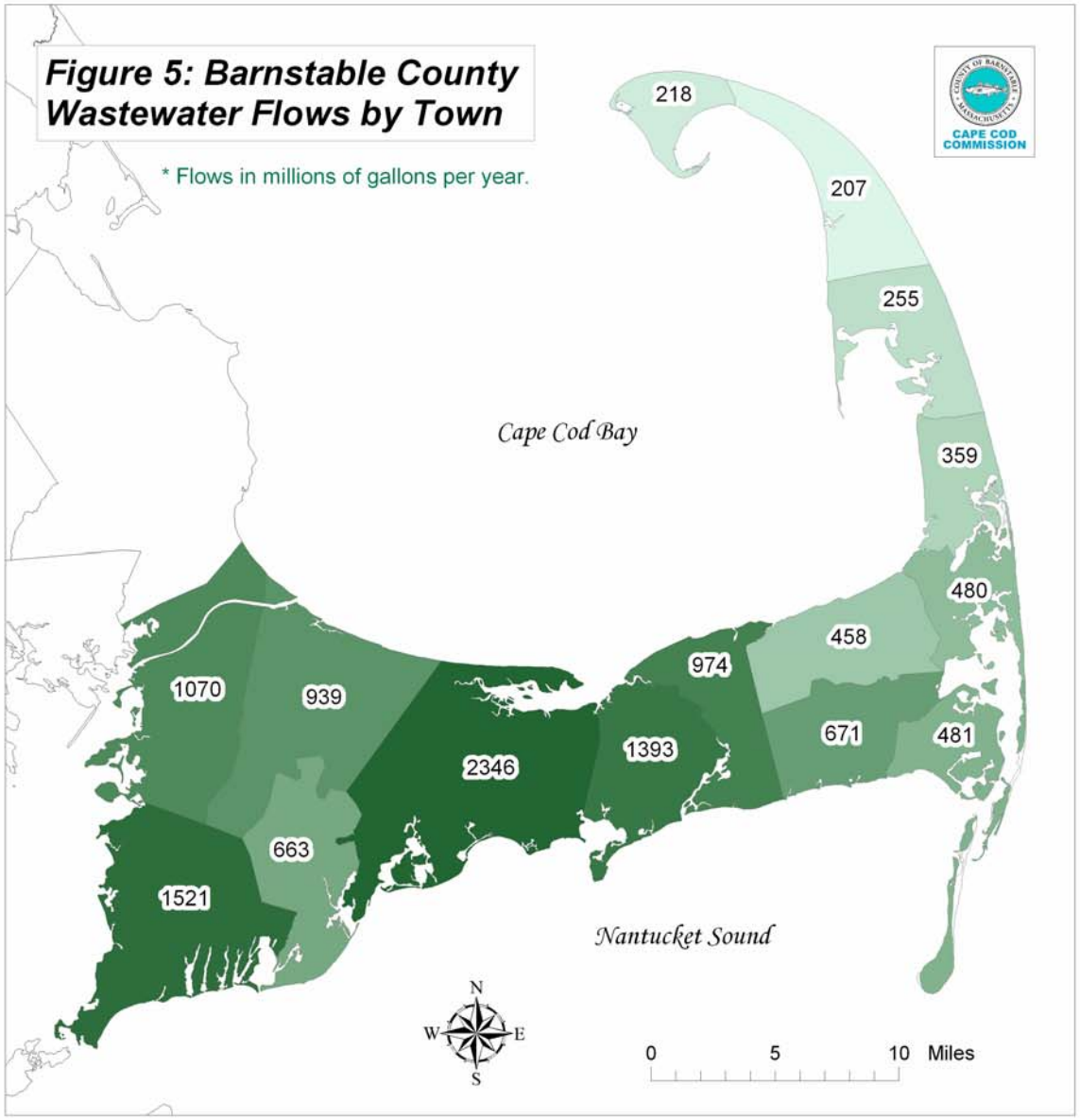
Figure 5: Barnstable County Wastewater Flows by Town
* Flows in millions of gallons per year.
CAPE COD COMMISSION
218
207
255
359
480
458
974
671
481
1393
2346
1070
939
663
1521
Cape Cod Bay
Nantucket Sound
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10 Miles

2. Zone IIs

Regionally, 3.6 billion gallons per year of wastewater is discharged into Zone IIs (Figure 6). This flow is approximately 30 percent of the total wastewater generated on Cape Cod. On a town-wide basis, flows in Zone IIs range from a high of 54% in Barnstable to a low of 4% in Orleans. It is interesting to note the towns with higher flows in the Zone IIs are those where development is more widespread. These towns (*e.g.*, Barnstable, Mashpee, and Sandwich) also tend to have a number of interior freshwater ponds that have attracted significant development. Those towns with lower percentages tend to have most of their development near the coast and/or have restricted development in their Zone IIs. For example, Orleans has only 4% of their town-wide wastewater in Zone IIs. Orleans also has the advantage that most of the area of their Zone IIs are in Brewster (see Figure 6). No effort was made to correct the estimates for town boundaries.

Commission staff have also been working with the Cape Cod Center for Sustainability to develop and produce indicators of the impact of development on both our built and natural environment (Cape Cod Commission, in prep.). Nitrogen in public water supply wells was selected as one indicator for further review. Staff evaluated the 2002 nitrate-nitrogen concentrations from the 136 gravel packed public water supply wells and compared these results with a similar analysis conducted in 1993. This analysis found that although Cape Cod's drinking water quality is generally very good, there is a trend of increasing nitrate-nitrogen concentrations that is evident during the past decade.

Between 1993 and 2002, the percentage of public water supply wells tested at or below 0.5 ppm nitrogen (i.e., generally considered background) decreased from 57% to 41%. During the same period, the percentage of wells that were between 0.5 and 5-ppm increased from 43% to 58%. Between 1993 and 2002, between 1% and 3% of these wells reached a level above 5-ppm of nitrate, including one well above 10-ppm.

Although the trend indicates higher nitrate concentrations from development in Zone IIs, the proportion of "clean" wells are generally a reflection of the large amounts of undeveloped lands surrounding the public supply wells, and the predominance of larger residential lots in wellhead protection areas. However, more detailed nitrogen loading analyses that have been prepared for many of the Zone IIs have indicated that many will reach the regional nitrogen loading standard of 5 ppm under build out conditions (Cape Cod Commission, 1994,1996, and 1997). Additional review of the most impacted wells show that concentrations generally reflect more urban development in the Zone IIs and water from these wells also contain traces of other contaminants such as volatile organic compounds.

On the outer Cape, wastewater disposal and water supply are even more directly linked because they occur on the same lot. An 2002 analysis of 183 small volume, non-community supply wells in Eastham and Wellfleet indicates that 89% were at or below 5 ppm and 11 percent were higher than 5 ppm (Cape Cod Commission, 2003). This analysis of private well water quality indicates that nitrate concentrations of concern are more likely to occur at housing densities of less than one house per acre (Sobzack and Cambareri, 2002). This analysis also suggests that alternative water supplies should be assigned a high priority in densely developed portions of these towns.

Figure 6: Barnstable County Wastewater Flows by WPA

This map depicts the boundaries for each of Barnstable County's 15 towns in addition to Wellhead Protection Areas (WPA) for municipal public supply wells. Estimates of each town's wastewater generation (millions of gallons per year) within WPA boundaries are shown in the table below.

TOWN	FLOW
Barnstable	1293
Bourne	303
Brewster	86
Chatham	90
Dennis	148
Eastham	no WPA
Falmouth	118
Harwich	205
Mashpee	277
Orleans	18
Provincetown	no WPA
Sandwich	397
Truro	46
Wellfleet	no WPA
Yarmouth	605
Barnstable County	3587

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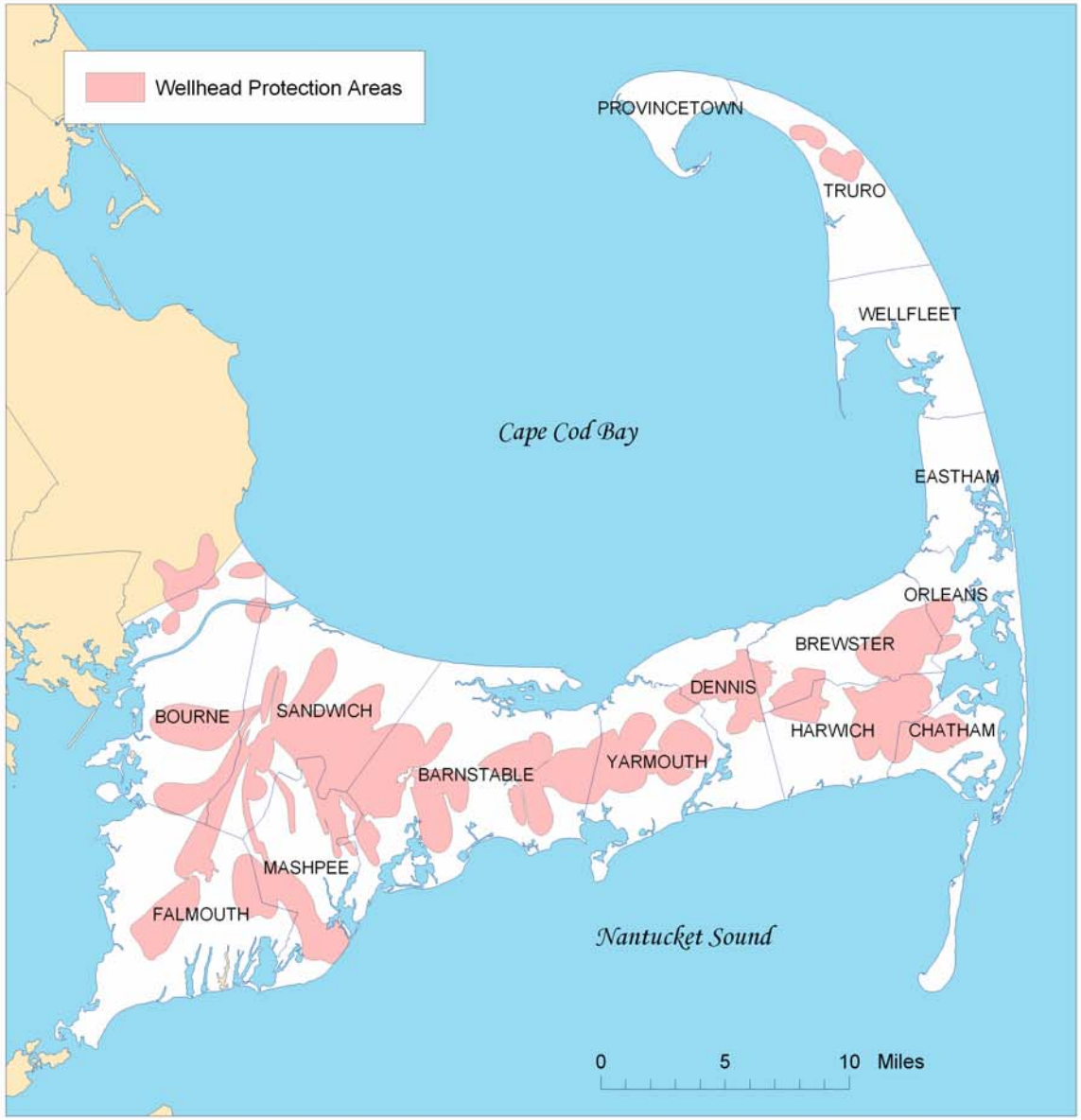


3. Marine Embayments

Approximately 80% of the total Cape Cod wastewater flow is contained in watersheds to coastal embayments (Table 5, Figure 7). This is not too surprising given that coastal watersheds are much larger than Zone II areas and stretch from the coastline all the way up to the groundwater divide, which is usually located in the middle of the peninsula. Because of the size of the watersheds, they also capture much of the high-density development near the coast. The range of wastewater flows in marine embayments range from a low of 18 million gallons per year for Herring River in Eastham to a high of 1.2 billion gallons per year for Lewis Bay in Barnstable.

About 20% of the wastewater flow of Cape Cod is not in a watershed to a marine embayment but a watershed where groundwater discharges directly to open coastal water, such as the Cape Cod Canal, Nantucket Sound, Cape Cod Bay and the Atlantic Ocean.

Although the amount of wastewater flow is an important consideration in evaluating the potential impact on these embayments, other factors such as tidal range and embayment volume play a significant role. Embayments on the southern coast are generally more susceptible to impacts because the tidal range is generally 1/2 to 1/3 of the range observed in Cape Cod Bay. So for example, Wellfleet Harbor has a 9 foot tidal range, while Popponessett Bay has a 3 foot tidal range; more water is available to dilute and remove nitrogen loads in Wellfleet Harbor than in Popponessett Bay (Cape Cod Commission, 1998).

Wastewater impacts on coastal embayments are a cause for concern on Cape Cod. Coastal embayments are primary habitats for shellfish, spawning grounds for commercial important fishing stocks, and are some of the primary recreational areas on the Cape. Since pollutants from land use development, including wastewater, find their way into the groundwater and ultimately to the coast, coastal embayments receive all of the nutrients and other pollutants discharged within their watersheds.

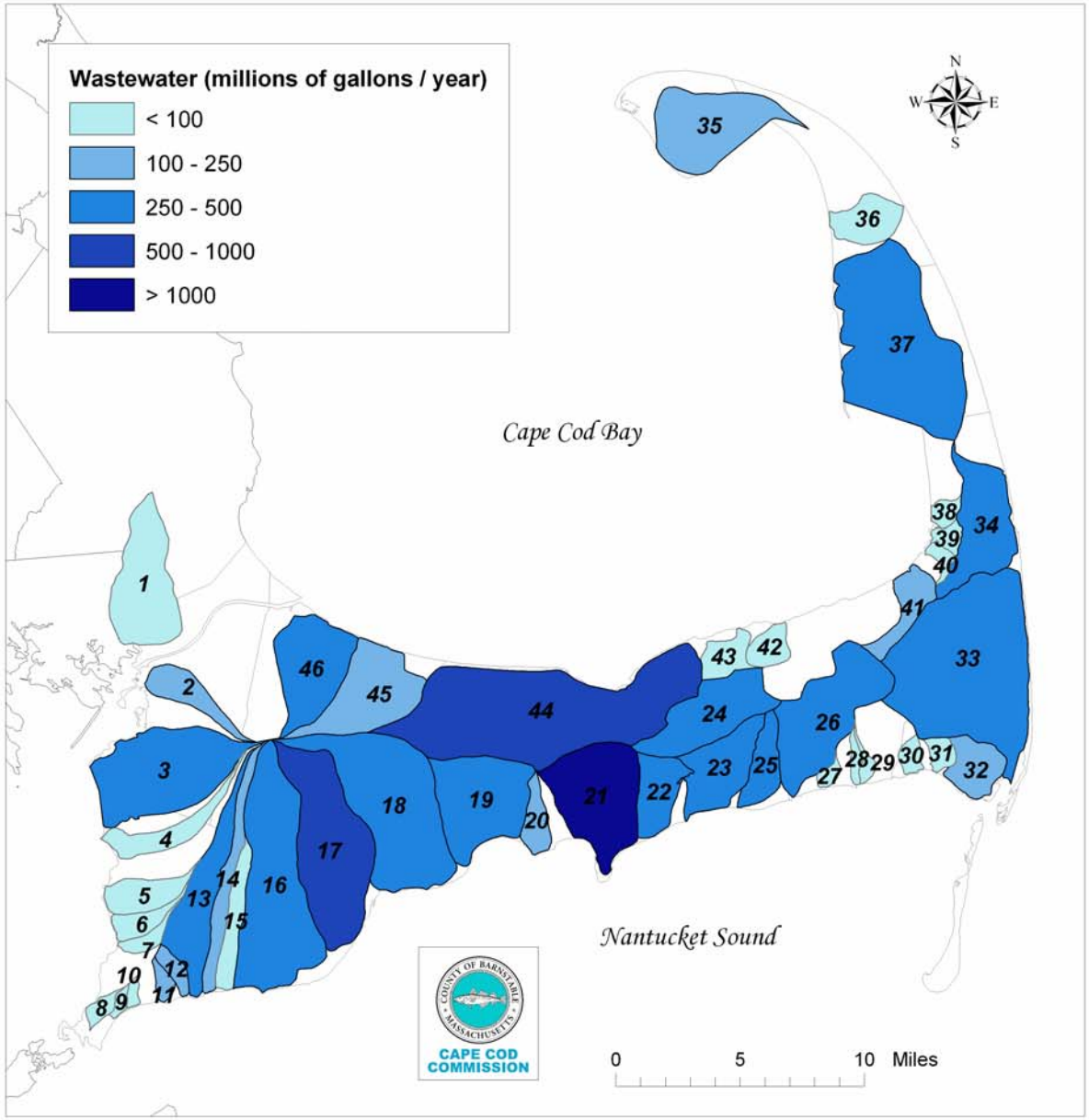
The key nutrient of concern is nitrogen. Nitrogen is a fertilizer prompting plant growth, subsequently feeding animals that graze on the plants, and finally bigger animals that feed on the grazers. Eelgrass is the dominant plant in healthy embayment ecosystems, usually surviving on sparse amounts of nitrogen, and providing habitat for all the animals living in the embayments. As additional nitrogen is added to an embayment, other plants crowd out the eelgrass and destroy the animal habitats. Ecologists refer to the nitrogen load that changes the system from an eelgrass-dominated system to one where other plants dominate as a critical threshold.

The science to define critical thresholds has been advancing over the past decade. Efforts have included defining watersheds, estimating nitrogen loads, evaluating ecosystem interactions between embayment species, and collecting water quality data. Organizations such as the Commission, Buzzards Bay Project, DEP, Coalition for Buzzards Bay, Woods Hole Oceanographic Institute (WHOI), and US Geological Survey (USGS) have all played a role in these efforts.

Figure 7: Barnstable County Wastewater Flows to Coastal Embayments

This map depicts the boundaries for each of Barnstable County's 46 major Marine Water Recharge Areas (MWRAs). Estimates of wastewater flows (millions of gallons per year) in each MWRA are shown in the table below.

Embayment	ID#	Flow
Buttermilk Bay	1	51
Back River	2	102
Megansett Harbor	3	316
Wild Harbor	4	91
West Falmouth Harbor	5	98
Great Sippewisset Creek	6	20
Little Sippewisset Creek	7	11
Quissett Harbor	8	19
Oyster Pond	9	12
Salt Pond	10	19
Falmouth Harbor	11	144
Little Pond	12	174
Great Pond	13	268
Green Pond	14	102
Bournes Pond	15	87
Waquoit Bay	16	306
Popponesset Bay	17	530
Three Bays	18	477
Centerville River	19	494
Halls Creek	20	141
Lewis Bay	21	1247
Parkers River	22	358
Lower Bass River	23	367
Upper Bass River / Mill Pond	24	414
Swan Pond / River	25	265
Herring River	26	266
Allen Harbor	27	47
Wychmere Harbor	28	24
Saquatucket Harbor	29	32
Taylors Pond / Mill Creek	30	61
Sulfur Springs / Bucks Creek	31	60
Stage Harbor	32	164
Pleasant Bay	33	418
Town Cove / Nauset Marsh	34	298
Provincetown Harbor	35	236
Pamet River	36	32
Wellfleet Harbor	37	291
Herring River (Eastham)	38	17
Boat Meadow Creek	39	31
Rock Harbor	40	94
Namskaket Creek	41	112
Quivett Creek	42	30
Sesuit Harbor	43	97
Barnstable Harbor	44	578
Scorton River	45	217
Sandwich Harbor	46	313



As result of the advances in estuary science, Barnstable County, through the Regional Policy Plan, adopted a regulatory structure to begin to apply this science to land use development proposals that come before the Commission. This structure has been modified with each 5-year revision of the RPP to reflect updates in the amount of knowledge about the Cape's embayments and their ecosystems. The current version of the RPP requires projects within watersheds to embayments with water quality problems to have no-net nitrogen loading; in other words, the amount of nitrogen added by the project must be offset by an equivalent reduction. Watersheds with no-net nitrogen loading are listed in Table 6.

Over the past five years or so, it has become increasing clear to many of the organizations involved in assessing and protecting embayments that a more comprehensive effort was necessary to link together regulatory and scientific activities and realize solutions for many of the observed coastal water quality problems. As a result, the state DEP and the University of Massachusetts at Dartmouth, School of Marine Science and Technology (SMAST) have begun the Massachusetts Estuaries Project, which is dedicated to addressing coastal water quality concerns in all the estuaries/embayments in southeastern Massachusetts. Table 6 lists all the estuaries to be addressed on Cape Cod.

Because findings from this project have the potential to influence land use, wastewater, and water quality protection strategies, funding is very broad-based with contributions from many sources, including: US Environmental Protection Agency, Barnstable County, DEP, Massachusetts Coastal Zone Management, local funding agencies, and municipalities throughout the region.

The Massachusetts Estuaries Project team, which includes the US Geological Survey and the Commission, is developing refined embayment water quality models that are combined together with refined watershed nitrogen loading models. Data input into these models includes: three years of volunteer-collected coastal water quality data, tidal flushing data, bathymetric information for estuaries and freshwater ponds, pond water quality data, current and historic eelgrass coverages, water use information, wastewater treatment plant performance, landfill monitoring data, watershed delineations, sediment nutrient regeneration, and wetland nitrogen attenuation. Development of these linked models will allow communities to explore various wastewater management scenarios and their potential impacts on coastal water quality.

Table 6.

Cape Cod Embayments

Massachusetts Estuaries Project and Cape Cod Commission No Net Watersheds

Cape Cod Embayments		MEP	CCC NoNet Wtrshds
Community	Watershed and Embayment		
Bourne	Buttermilk & Little Buttermilk Bays	X	X
	Phinney's Harbor	X	
	Back River/Eel Pond	X	X
	Pocasset River	X	
	Pocasset Harbor/Hen Cove/Red Brook Hbr	X	
Falmouth/ Bourne	Megansett Harbor/Squeteague	X	
	Rands Harbor	X	X
	Fiddlers Cove	X	X
Falmouth	Wild Harbor	X	
	West Falmouth Harbor	X	X
	Quissett Harbor	X	
	Oyster Pond	X	
	Salt Pond	X	
	Falmouth Harbor	X	
	Little Pond	X	
	Great/Perch Pond	X	X
	Green Pond	X	X
	Bournes Pond	X	X
	Eel River, Falmouth	X	X
Mashpee/ Falmouth	Waquoit Bay-Proper	X	X
	Childs River	X	X
Mashpee	Hamblin Pond/Jehu Pond/Quashnet River	X	X
Mashpee/ Barnstable	Popponesset Bay	X	X
	Mashpee River		
	Shoestring Bay		
	Ockway Bay		
Barnstable	Rushy Marsh	X	
	Three Bays	X	X
	Prince Cove		
	North Bay		
	Cotuit Bay		
	East Bay/Centerville River/Halls Creek	X	X
Barnstable/ Yarmouth	Lewis Bay System	X	
	Hyannis Harbor		
	Snows Creek		
	Lewis Bay		
	Barnstable Harbor/Great Marshes	X	

Cape Cod Embayments		MEP
Community	Watershed and Embayment	
Yarmouth/ Dennis	Bass River	X
	Dinahs Pond	
	Follins Pond	
	Mill Pond	
Dennis	Swan Pond/River	X
	Sesuit Harbor	X
Harwich	Saquatucket Harbor	X
	Allen Harbor	X
	Herring River	X
	Wychmere Harbor	X
Chatham/ Harwich	Taylors Pond	X
	Muddy Creek	X
Chatham	Sulfur Spring/Bucks Creek	X
	Stage Harbor System	X
	Bassing Harbor/Ryders Cove/Frost Fish Creek	X
	Chatham Harbor	X
Orleans/ Harwich/ Brewster	Upper Pleasant Bay	X
	Round Cove	
	Meetinghouse Pond	
	Areys Pond	
Orleans	Namskaket Creek	X
	Little Namskaket Creek	X
	Rock Harbor	X
Orleans/ Eastham	Nauset Marsh	X
	Town Cove	
	Salt Pond	
Wellfleet	Wellfleet Harbor	X
	Duck Creek	
	Upper Blackfish Creek	
	Upper Hatches Harbor	
Truro	Pamet Harbor	X
Provincetown	Provincetown Harbor	X
	Hatches Harbor	X
Sandwich	Sandwich Harbor	X
	Scorton Creek	X

X = Estuary prioritized in top 20 to be addressed by Massachusetts Estuaries Project

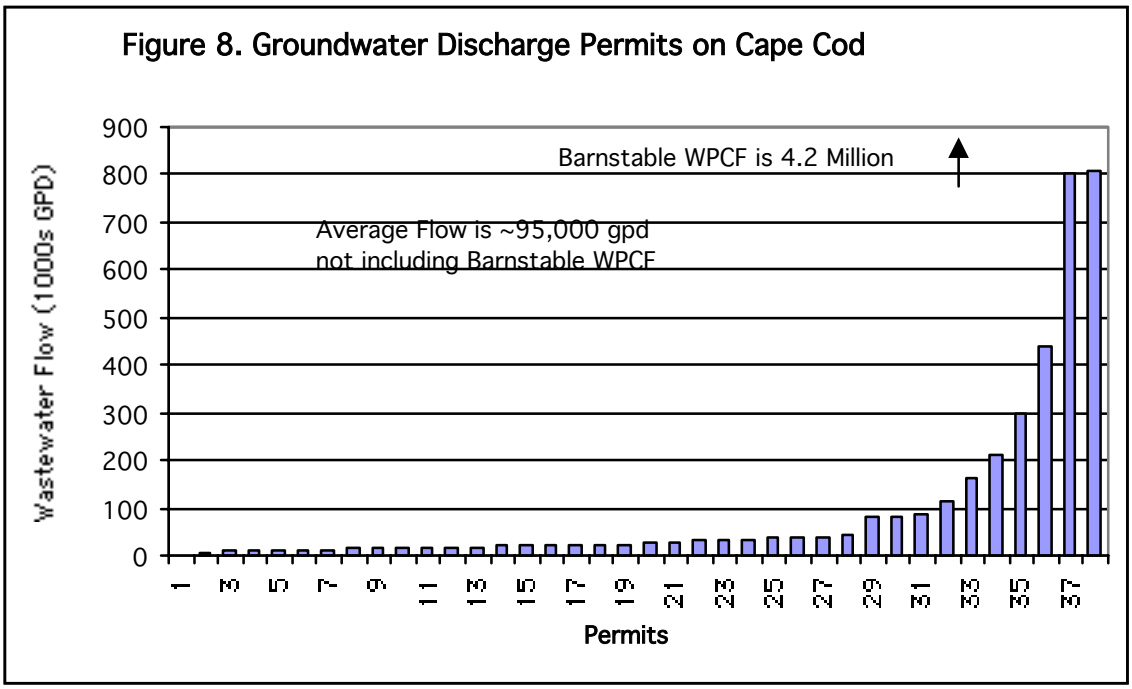
NOTE: Additional embayments may be identified as "no net" following information gathering related to proposed regulatory developments in their waters

4. Conceptual Major and Minor Regional Growth Centers

As mentioned in the first section, Cape Cod Commission staff are working on developing criteria for Growth Incentive Zones (GIZs). If proper wastewater infrastructure is made available to GIZs, then development patterns could be changed to accommodate village style development and/or major commercial and mixed residential development. Commission staff and town planners are in the beginning stages of delineating GIZ areas on Cape Cod and it is much too early to formally present any actual spatial data on them. However, staff applied the simple wastewater conversions to a limited sample of the available GIZs to get a rough understanding of the types of wastewater flows that are in these areas presently. The available GIZs are divide between so called major and minor categories.

Within five major GIZs, present wastewater flow volumes range from 200,000 to 1.1 million gallons per day (gpd). Wastewater flow ranges from 95,000 gpd to 312,000 gpd in the minor GIZs. These flow volume estimates are a clear indication that Cape Cod will require some fairly significant treatment capacity if a policy of intensified development in select areas is pursued. Three of the available major GIZs are already sewered. But because of dissimilar boundaries of the GIZ and sewer service areas, it was not possible within the scope of this project to prepare compare flow estimates to flows received at the treatment plants. Further discussion about wastewater infrastructure needs within all GIZs will occur in the future.

Data on the DEP groundwater discharge permits on Cape Cod are another indication of wastewater infrastructure requirements. Groundwater discharge permits are required by DEP for any wastewater system with a Title 5 flow of 10,000 gallons per day or greater (310 CMR 5.00). There are 41 groundwater discharge permits on Cape Cod (Figure 8). If the lowest (2,300 gpd) and the highest (4.2 million gpd) permit volumes are not included, the permit volumes range from 6,250 gpd to 810,000 gpd with an average of 95,000 gallons per day.



V. Wastewater Management Districts

It is becoming increasingly clear that Cape Cod will require innovative management strategies and additional treatment capacity to accomplish any significant changes in wastewater infrastructure and water quality improvement. The third task under the EOEA grant was to conduct a case study of selected town or sub-watershed to develop a model wastewater management district with various legal and institutional implementation procedures. This task was seen to complement the work that DEP has recently completed providing general guidance on wastewater management districts (DEP, 2003). Subject to further evaluation of this task and the budget constraints of the grant project, it became clear that review of a single case study would not be able to cover the variety of wastewater management needs on Cape Cod. Therefore as mentioned in the previous section, staff, with approval of the WIC, sought support and obtained additional funding from Barnstable County on this Task 3 item. Working under the scope of the EOEA grant, the WIC was able to leverage $55,000 to expand this task to cover four case studies and conduct a more extensive study of wastewater management districts than would have been possible using only EOEA grant funding.

The WIC has discussed a number of issues to be addressed within the case studies. The project will assist the towns and DEP in evaluating the legal, financial and administrative tools for establishing better wastewater management. Since these tools will constitute innovative institutional approaches for Cape Cod, it is also the goal of this task to increase the communities' familiarity with the tools and, by doing so, accelerate implementation of these options within Cape communities. The DEP guidance on wastewater management districts indicates that local management district initiatives require close work with a large group of stakeholders and that discussions with local officials, legal counsel, and the DEP and EPA are crucial (DEP, 2003). It is an important component of the WIC's role to coordinate and provide a forum for discussions of the available tools that will be identified through the case studies. The discussion of tools and the case study results will also help the WIC to reach its goal of preparing a regional wastewater management planning strategy document.

A. Wastewater Management Needs

During the WIC's discussions of this task, the WIC identified a generalized list of five factors to consider when establishing wastewater management districts: 1) Public health, 2) Surface water quality restoration/protection, 3) Private well water quality, 4) Community character (alternatives to mounded systems), and 5) Sustainable economic development.

The WIC has also identified a number of general wastewater management arrangements that need to be considered in a review of potential wastewater management district needs on Cape Cod.

- A watershed wastewater management district to restore water quality within an embayment.
- A wastewater district to sustain economic development in a portion of town.
- A town-wide district to enable sub-management districts with various objectives.
- Districts that require inter-municipal management
- Regional Overlay District for alternative on-site systems
- Town with centralized wastewater treatment that requires wastewater management outside the service area.
- Town with numerous private facilities that could be operated collectively.

The WIC also identified a concern that the current variety of wastewater technologies and the potential variety of wastewater aggregation will need to be considered in the development of wastewater management districts, including:

- alternative on-site system management
- neighborhood cluster systems
- centralized wastewater collection systems and facilities for commercial villages and 500 to 1000 residential users.

B. Wastewater Management District Project

The Wastewater Management District Project is an expanded Task 3 item of the EOEA/DEP grant. The project consists of two tasks. The first task, starting with DEP general guidance, is a detailed assessment of the options and tools for wastewater management on Cape Cod. The second task is to evaluate four areas of Cape Cod as samples or case studies where new wastewater management options and tools could apply.

The first task under the expanded Task 3 includes review and explanation of current Massachusetts state and municipal law and relevant Massachusetts's regulations and to identify the full breadth of the problems and need for additional technical and administrative tools related wastewater management. A subcommittee of the WIC called the Working Group, comprised of County staff and representatives of the four case study towns was established to guide oversight of the expanded Task 3. Working with the WIC's Working Group, consultants will identify specific wastewater management tools for Cape Cod that presently exist, tools that need improvement, and tools that require further development.

The WIC provided a variety of particular questions to be addressed during this task, including:

1) The Committee wants to know if within a district, for which some wastewater services will be provided to restore water quality, can cost also be borne by units that do not receive any direct physical benefit.
2) Is it possible to establish a local tax to offset the costs of planning, engineering and implementing wastewater solutions?
3) What options are available for inter-town watershed districts where one town does not abut the actual resource?
4) What are the differences and constraints and advantages of various district funding mechanisms like a betterment, tax or fees.
5) What interim measures can a district adopt prior to implementing it solutions?

The second task under the expanded Task 3 includes a review of four case studies which were selected by the WIC to assist in exploring the potential on-the-ground issues associated with the management district tools. The case studies are as follows.

1) A town-wide wastewater district in the Town of Orleans that can accommodate a downtown business center and a sample watershed specific nutrient management district for Meetinghouse Pond.
2) A regional wastewater management district for the Popponessett Bay watershed between Mashpee and Barnstable.

3) A watershed specific nutrient management district for the Three Bay watershed in the Town of Barnstable, comprising Prince Cove, Cotuit Bay, West Bay and North Bay, that includes two growth/activity centers.
4) Coastal Pond Protection District in the Town of Falmouth.

For each case study, the project will:

1) Provide a detailed description of the Case Study District(s)
2) Establish the key issues by describing a conceptual understanding of the wastewater problem and potential solutions gained from review of existing studies and discussions from County staff and town representatives
3) Establish the wastewater management objective of the Case Study.
4) Establish a working plan for each case study.

The case studies will be provided a set of potential management tools (drawing from the results from Task 1) that is appropriate to address the specific objectives of the case study. Each case study will provide guidance in how these tools should be implemented and estimate the approximate funding needs and long-term operating costs. The case study reports will be reviewed by the WIC and then made available to officials in the target towns. Town officials and others will be asked to raise questions and make comments on the draft in preparation for the final report

C. Project Status, Deliverables and coordination with DEP

A RFP was issued on December 12, 2002. Barnstable County received five responses, interviewed three and selected the firm of Wright-Pierce to conduct the work. The Wright-Pierce team includes legal consultants CLF Ventures and Teal Associates, who are also working with APCC and the Business Round Table consultants on their wastewater project, which is described in the previous section.

The contract was signed for $55,000 on March 5th. The Working Group, comprised of County staff and representatives of the four case study towns, was established. The Working Group has meet twice with the consultants. The Wright-Pierce team is preparing a draft Task One report and is presently collecting information for the case studies of task two. The case study portion of the project includes several meetings with broader town input.

The draft task one report is expected in June 2003. Case study workshops will be held through the summer and a draft final report is scheduled for late August. The Final project report is scheduled for delivery in September 2003, presuming that community meetings through the summer can be arranged.

Staff will provide DEP with a schedule of the meetings, meeting summaries, interim and draft reports for comment and copies of the Final report. The interim and final reports will specify the financial and technical contributions of the Department as required.

VI. SUMMARY

The opportunity to create a Wastewater Implementation Committee (WIC) was a direct result of the EOEA priority project grants program. The WIC has been formally established as an advisory committee to Barnstable County, providing a forum for discussion and investigation of wastewater issues. The WIC has discussed its role a number of times and is satisfied that it will continue to serve the County and towns beyond the immediate objectives of the EOEA grant. The WIC is now engaged in: 1) Wastewater Management Districts study, 2) assisting the County in prioritizing expenditures for wastewater projects, 3) developing new initiatives, 4) discussion and preparation of a Regional Wastewater Management Planning document and 5) providing a regional forum for on-going projects and programs. The work begun through the EOEA grant has provided Barnstable County and the towns of Cape Cod with important initial products that will serve them well as they seek solutions for wastewater management, resource protection, and economic sustainability.

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APPENDICES

APPENDIX A	Project Press Coverage
APPENDIX B	WIC Membership
APPENDIX C	Town Matrix of Wastewater Planning Status and Concerns
APPENDIX D	Wastewater Facility Planning Flow Chart
APPENDIX E	Draft Regional Wastewater Management Plan Outline
APPENDIX F	GIS Map Source Details

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IN OUR VIEW

Wastewater management

■ Residential septic systems pollute ponds and coastal embayments; it's time to create management districts.

To find concrete evidence of how residential septic systems affect the Cape's coastal waterways, consider the work of the Waquoit Bay National Estuarine Research Reserve in Falmouth.

For more than a decade, scientists there have been studying the effect of wastewater on Waquoit Bay. The deteriorating health of the bay, from algae blooms to changes in the marine ecosystem caused by excessive nitrogen from septic systems, has been well documented.

Now multiply these problems by the 240 great ponds and 43 coastal embayments on Cape Cod.

Get the picture?

Wastewater management is one of the most important issues facing the Cape. That's why a committee of 23 Cape residents and town officials has been wrestling with the problem over the past year.

> A complex problem involves a complex set of initiatives, but part of the solution involves the creation of wastewater management districts.

"The on-site septic systems don't remove nitrogen, and nitrogen represents a public health threat in our drinking water (and) causes eutrophication in our coastal embayments," said Thomas Cambareri, a hydrologist with the Cape Cod Commission.

So what's the solution?

A complex problem involves a complex set of initiatives, but part of the solution involves the creation of wastewater management districts.

Each district, in the view of the Wastewater Implementation Committee, might address the problem in different ways, depending on the circumstances.

Some neighborhoods may need technological improvements to backyard septic systems; new neighborhoods may require small treatment plants; older neighborhoods, where nitrogen loading in nearby bays and ponds is especially serious, may require treatment plants like the one in North Falmouth; heavily developed areas may need large plants like the one serving the Hyannis area.

"We have in Falmouth approximately 15 different watersheds that impact ponds when they get to the coast, and each of those may require a different solution with regard to wastewater," said John Waterbury of the Falmouth Board of Health, who represents the town on the Wastewater Implementation Committee.

The first step in the creation of wastewater management districts is a study by an environmental engineering firm. The study will review the legal requirements and administrative burden of establishing wastewater districts across Cape Cod.

Fortunately, such a study has been funded by a $55,000 grant from the Barnstable County Economic Development Council's license plate program and the Assembly of Delegates.

A Maine firm has been hired to assemble four case studies: a townwide wastewater district in Orleans; a regional wastewater district for the Popponesset Bay system between Mashpee and Barnstable; a district for the Three Bays watershed comprising Prince Cove, Cotuit Bay, West Bay and North Bay; and a district protecting coastal ponds in Falmouth.

The firm will review state and town laws to recommend legal options for establishing the districts; examine possible funding mechanisms for the districts; and examine the possibility of inter-town agreements for districts crossing town borders.

The Wastewater Implementation Committee is on the right path, and not a moment too soon.

O'Leary proposes wastewater authority

■ The senator has filed a 'placeholder' bill to ensure the issue is addressed soon by a Senate committee.

By FREDERICK MELO
STAFF WRITER

In an effort to help towns overcome the potentially staggering costs of keeping Cape Cod's waters clean, state Sen. Robert O'Leary, D-Barnstable, has proposed creating a sweeping new regional authority that would oversee wastewater treatment across the Cape.

"This is one of the most important environmental issues facing the Cape, and something we need to come to grips with," said O'Leary, addressing the county commissioners at their regular meeting yesterday.

Currently, 87 percent of the Cape is serviced by septic systems, according to the Cape Cod Commission. But development on the Cape has boomed with little planning or oversight with regard to wastewater issues, which need to be addressed much more aggressively and through varied means, O'Leary and other public officials said yesterday.

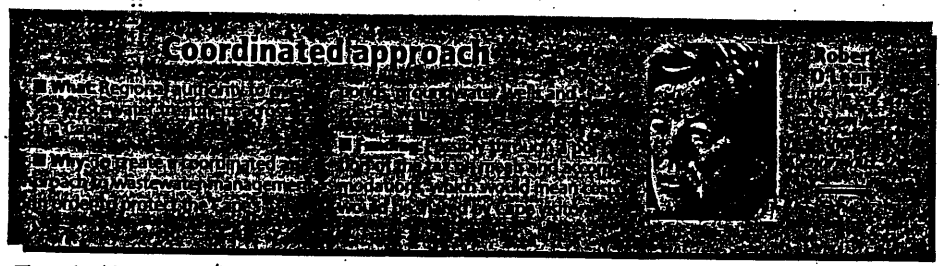
Estimates of the Cape's wastewater needs range from $500 million to $1 billion, O'Leary said. Those costs leave town officials at a loss for how to get voters to approve pricey treatment plans.

O'Leary's primary solution is to create a state-authorized entity in a similar vein as the Massachusetts Water Resources Authority.

Established in 1984, the MWRA provides water and sewer services to 2.5 million residents from Boston to Worcester, or more than 40 percent of the state population.

Discussion sought in Senate

"This would clearly require an act of the state legislature," said O'Leary, who has filed a "placeholder" bill ensuring that his proposal is taken up by a Senate committee in coming months. "It would become a regional entity under state law.



There just isn't enough attention paid to this at the state level. We've got a problem here that's enormous."

In 1985, a federal court order required the MWRA to take drastic steps to keep Boston-area communities in compliance with the Clean Water Act.

That order led to the creation of a massive treatment facility at Deer Island.

O'Leary said he envisioned a more "bottom up" approach on Cape Cod, where membership in the authority might remain optional for towns or be coordinated through the county.

One likely outcome of a new regional wastewater authority might be to create sewer districts. Like those for water and other utilities, each wastewater district would have a treatment system tailored to its area.

Tom Cambareri, a hydrologist with the Cape Cod Commission, has been working with a Capewide committee of residents and public officials on the concept of wastewater districts since May.

Three general categories of treatment options include backyard septic systems, neighborhood-based treatment plants, or large-scale plants like the one serving the Hyannis area.

Assembly Speaker Tom Bernardo noted that a new authority would face the "monumental hurdle" of finding a reliable revenue stream.

Taxes could provide funding

O'Leary floated the idea of funding the authority through a portion of the meals tax, hotel/motel tax, or a potential tax on short-term rental accommodations.

That would allow costs to be shared by visitors to Cape Cod, who also contribute to pollution, O'Leary said.

Efforts to protect the Cape's ponds, groundwater wells and coastal embayments have spawned nearly two dozen scientific, legal and financial outreach initiatives, Cambareri said.

The county Assembly of Delegates, for instance, is poised to reserve $350,000 from the county surplus for future wastewater needs on Dec. 18.

The towns of Eastham, Harwich, Orleans and Yarmouth have active wastewater committees.

Barnstable, Chatham and Falmouth are in the process of upgrading their treatment facilities, while Provincetown is building a new one.

The result of those efforts has been a patchwork quilt of approaches.

And uncoordinated attempts to manage wastewater could prove as much bane as boon to homeowners unless an umbrella authority is formed, O'Leary said.

"It would be a mistake to have a homeowner put in a $20,000 (septic) system that four or five years later is going to be bypassed by a treatment plant," he said.

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IN OUR VIEW

Going with the flow

7-14-01 CCTimes

■ As ponds green up, watershed management districts may be an effective way to get at the problem.

We have separate taxing districts to supply clean water coming into the house. Why not a similar district to manage dirty water going out?

The Ashumet Plume Citizens Committee organized a few years ago around the clean-up of an Air Force pollution plume flowing south through the Ashumet River valley. Now they are casting a wider net. The plume, coming underground from a former wastewater treatment plant at Otis, will bring only a smidgen of nitrogen pollution to the saltwater ponds along the coast compared to septic tanks and lawn fertilizer from the Ashumet neighborhoods themselves.

The committee is proposing a watershed management district with authority to tax property owners, regulate individual septic systems more aggressively and build and manage waste-treatment facilities. The district boundaries would follow the actual watershed drainage, starting near the Falmouth village of Hatchville on the north, broadening through the East Falmouth and Waquoit neighborhoods and reaching the sea at Bourne, Green and Great ponds.

The Cape is a region where sandy soil generally made septic tanks good enough to meet basic public health needs, so most towns have not been compelled to build expensive sewering. But now stinking algae blooms and shellfish die-offs are reminding us that there is more to septic waste than disease-causing microbes. Even "clean" outflow contains nitrates, which become fertilizer, and thus pollution.

The thick, manicured lawns many homeowners prefer require nitrogen fertilizer to keep them green, and there is runoff there, too. Especially on the Cape's south shore, where tidal flushing is not as great as on the bay, certain ponds and estuaries are choking on the extra algae and weed growth.

For such well-defined watersheds – the Three Bays area of Barnstable is another example – a district with a clear-cut task might get the job done.

But it won't come cheap.

The Ashumet committee, already well grounded in the science of water protection, estimates it will cost between $600 and $800 per home each year for the monitoring and repair to keep pollution out of the ponds. Nevertheless, these site-specific solutions are probably the wave of the future on Cape Cod, says Cape Cod Commission water-resources specialist Tom Cambareri. If polls are correct, people are willing to pay for environmental protection. They are more likely to pay for work in their own neighborhoods.

"People have to decide if they want their shore to be a sheet of water we look at but don't touch, or whether it should be a place you can make your living, where the shellfish can thrive," Cambareri said.

The idea of a watershed management district is still early in the conceptual stage. Cambareri is looking at grants that could pay for study of the legal aspects of setting up such districts, which could include parts of several towns.

But as decades worth of nitrates start draining out at the shore, wastewater management is shaping up as the next environmental battleground. Such districts could be potent weapons in the regulatory arsenal.

WHAT'S YOUR OPINION?

All letters to the editor must be signed and include a phone number for confirmation. Letters are subject to editing, and must be 250 words or less.

The Cape Codder

EDITORIAL PAGE

Looking ahead in 2003

During the recent election campaign, virtually every candidate for the state Legislature identified one priority as paramount: finding ways to finance up to $1 billion in wastewater treatment systems – before nitrates destroy our estuaries, ponds and, inevitably, our very economic well-being.

Now, the rhetoric must turn to action, and voters will learn who among their state representatives can deliver beyond words. Political accountability has never been more critical – with the fate of our environment hanging in the balance.

But accountability must extend beyond our elected officials, who – after all – have modest political capital to back up their best intentions. For them to succeed, all Cape Codders must see themselves as partners in the battle.

Actually, it is a set of battles. One must significantly strengthen our historically weak standing on Beacon Hill by convincing both Gov. Mitt Romney and the Legislature that the entire state has a huge stake in the Cape's environmental health. If we lose, Massachusetts' taxpayers lose.

The second battle occurs right here on the peninsula. When it comes to wastewater treatment, individual towns simply can't do the job alone. They will need unprecedented assistance from Barnstable County government – in ways that will forever redefine the way we do business politically and economically on Cape Cod.

Neither battle will be easy.

Asking state government for any money in 2003 may seem futile, given a $1 billion to $2 billion budget gap – and few signs that Massachusetts' economy is about to recover anytime soon.

Yet, failing to act now threatens the state coffers for years to come. And here's why: If nitrates and pollutants invade the Cape's ponds, lakes and shorelines, tourism dollars will shrink. That will dramatically erode tax revenues that go directly to the state.

It's past time for the Cape's legislators, business leaders, government officials and everyday residents to make this economic argument clearly, persistently and audibly.

Because we shouldn't kid ourselves. We may love our environment, but it will be dollars that speak loudest. The environment must translate into a credible rate of return for Beacon Hill.

As the state copes with huge budget deficits and makes life-and-death decisions about hundreds of priorities, Cape Cod must demonstrate that every dollar of state assistance to support wastewater treatment has clear paybacks, beginning with a sustainable shellfish economy and a thriving tourism industry that assures rising tax revenues from meals, rooms and other spending.

State Sen. Robert O'Leary promises to lead the charge on Beacon Hill. He is well qualified for the challenge. He plans to introduce legislation that will authorize creation of a regional wastewater management authority for Barnstable County.

This new authority would have the power to raise funds and issue bonds to upgrade the Cape's treatment and disposal systems – not with one giant sewage system, but with a spectrum of solutions suited to particular towns, regions, shared aquifers and estuaries.

Such an authority – unprecedented on Cape Cod – would not depend solely on state dollars, but would require state approval. The money also would come from federal, county and private sources.

The framework for O'Leary's legislation has been developed as well through the Business Roundtable, an increasingly influential group of Cape business leaders and environmentalists. Their leadership will be critical in building economic and political support.

It is support not just for a specific piece of legislation, but also for an evolving mindset that emphasizes the indispensable role that county government plays in this particular arena.

Home rule still works. But not when it comes to wastewater treatment. The costs here are too much for any single town. Moreover, the bodies of water impacted by rising nitrate levels and other pollutants do not respect town borders.

County resources will be needed on at least three fronts:

Money – The economy of scale to attract financing, including underwriters for bonds;

Politics – The partnership of county commissioners and Assembly delegates to earmark surpluses for this priority;

Technical – The planning and scientific expertise at the county department of health and environment, which is studying many types of wastewater treatment systems; and at the Cape Cod Commission, which understands ways to coordinate zoning and development with these new technologies.

County officials demonstrated significant leadership in 2002, not only by identifying wastewater treatment as a priority, but by resisting strong pressure to return all surpluses to the towns for their individual uses. Instead, they have channeled much of the money into wastewater treatment research.

As with Beacon Hill, the argument at the town level also is economic.

Every board of selectmen on the Cape must be convinced that their own town's economies will benefit far more from solving the wastewater treatment crisis than by getting back a few more dollars this year to help soothe an ailing municipal budget.

This newspaper will work hard as well in 2003 to explore the wastewater crisis and illuminate economic, technological, zoning and political solutions. We also intend to sponsor local and regional forums on the issue and open our editorial pages to the views and visions of experts, as well as citizens like yourselves.

We begin the initiative by encouraging all our readers to support Sen. O'Leary and learn more about his legislative initiative. You can reach him at:

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High hopes and tight budgets

Guest Commentary

By Michael Gradone

As a general rule, I resist annual forecasts, reviews, analyses and other sorts of predictive rites of passage that imply a misleadingly neat unfolding of our shared

Reform has taken hold, and children (on the whole) do read and write and use math better than 10 or 50 years ago. In a society that too often pays lip service to academic achievement, that is a substantial accom-

WASTE MANAGEMENT

3-25-03

Districts seen key to saving Cape waters

by FREDERICK MELO
STAFF WRITER

For the past year, a committee of 23 Cape residents nd civic activists has been wrestling with the issue of vastewater management.

Environmental activists are concerned that Title 5 eptic systems, which outfit most homes and busiesses on Cape Cod, can't keep pace with the growing mount of wastewater Cape Codders are flushing into neir own back yards.

As a result, nitrates and other nutrients found in vastewater are making a gradual creep toward the Cape's 240 great ponds and 43 coastal embayments, hreatening to choke the oxygen from clear waters. lant life can overwhelm a body of water, turning it nto a murky sludge.

"The on-site systems don't remove nitrogren, and nitrogren represents a public health threat in our drinking water (and) causes eutrophication in our coastal embayments," said Tom Cambareri, a hydrologist with the Cape Cod Commission.

So what's the solution? There probably isn't just one. Cambareri thinks the answers may be as varied as the communities of Cape Cod.

Cambareri is the program manager of the Wastewater Implementation Committee, or WIC, a 23-member working group of residents and town offiils promoting the concept of wastewater managent districts.

Each district, in the WIC's view, might approach stewater management differently, depending on its

Why districts?

- **Nitrates** and other nutrients are fouling the Cape's 240 great ponds and 43 coastal embayments.
- Because various parts of the Cape approach wastewater management differently, wastewater treatment districts would allow **solutions tailored to the districts' needs**.
- An **environmental engineering firm** is studying the legal, administrative and funding hurdles to the district approach.

Each district, in the WIC's view, might approach wastewater management differently, depending on its own needs. Technological approaches tend to fall into three general categories, including backyard septic systems, neighborhood-based treatment plants, and large-scale plants like the one serving the Hyannis area.

"We have in Falmouth approximately 15 different watersheds that impact ponds when they get to the coast, and each of those may require a different solution with regard to wastewater," said John Waterbury of the Falmouth Board of Health, who represents the town on the WIC.

Through a competitive bidding process, the WIC recently selected the environmental engineering firm Wright Pierce of Topsham, Maine, to review the legal requirements and administrative burden of establishing wastewater districts across Cape Cod.

The firm has been hired to assemble four case studies: a townwide wastewater district in Orleans; a regional wastewater district for the Popponesset Bay system between Mashpee and Barnstable; a district for the Three Bay watershed comprising Prince Cove, Cotuit Bay, West Bay and North Bay; and a district protecting coastal ponds in Falmouth.

The firm will review state and town laws to recommend legal options for establishing the districts; examine possible funding mechanisms for the districts; and examine the possibility of inter-town agreements for districts crossing town borders.

Wright Pierce is expected to produce a report on its findings within six months. The process is being funded through $55,000 from the county's Economic Development Council License Plate program and the Barnstable County Assembly.

"A lot of folks are talking about (how) we need better wastewater management, but no one knows what the steps are to get there," Cambareri said. "Cape towns can get a better feel for what the endgame might be."

Cape wastewater woes lead to talk of regional authority

O'Leary files legislation

By Edward F. Maroney

The days of "flush and forget" regarding wastewater disposal are coming to an end on Cape Cod.

The county commissioners' meeting room was jammed Wednesday with political officials and department heads responsible for providing leadership on the issue of removing nitrogen from the waste stream before it can pollute embayments and groundwater. They made it clear that what needs to be done will hit residents in their pocketbooks, and that even protected open space will be used as part of the treatment regimen.

State Sen. Rob O'Leary said that he has filed a bill – at this point, really just a framework – to create a regional wastewater management authority that communities could vote to join. The new body would have the power to raise funds and issue bonds to tackle what has been described as anywhere from a half-billion to a billion-dollar effort to upgrade the Cape's treatment and disposal systems.

The senator is looking to flesh out the bill with the recommendations of the Barnstable County Wastewater Implementation Committee, a group with representatives from every town except Provincetown that has been meeting to gather information and review options on the science and financing required.

George Heufelder, director of the county health and environmental department, said more of

Continued on page 14

Barnstable Patriot 12-12-03

Cape wastewater woes lead to talk of regional authority...

Continued from page 1

the Cape will be sewered and that small community treatment plants will be an increasing important tool for maintaining water quality. As new technologies are being developed and tested, he said, "every time someone puts a standard Title 5 (system) in, we lose an opportunity for denitrification."

O'Leary said he was inspired to file the bill after talking with Barnstable Town Manager John Klimm, who told him his town faced spending almost $200 million for wastewater infrastructure, but lacked "the vehicle to make that happen."

Enter the authority, "some umbrella entity tied into the regional government," he said. Towns that joined would be able to set up wastewater districts based on the resources to be protected.

One way to build in a flow of revenue to the authority, O'Leary said, would be to add a percentage to the meals or rooms tax. "Some of that cost should be borne by (tourists)," he said. "They contribute to the problem and should be part of the solution,"

The political effort will be coimplicated, the senator said, noting the "power in Massachusetts is located within Route 128. They've solved this problem. (They have) the MWRA."

The Cape, he continued, "should not create a big, centralized bureaucracy" but rather seek "a structure that is conducive to our political tradition."

The next meeting of the Wastewater Implementation Committee will be on Jan. 13 at 1:30 p.m. in rooms 11 and 12 of Barnstable Superior Court House.

...ounty wastewater board seeks regional answers

Patriot 5-24-02

By Edward F. Maroney

...o hear George Heufelder tell ...he days of Cape Codders ship... ...g their wastewater to a faraway ...atment plant are numbered. ...Nobody wants it in their back ...d," the county health and env... ...nment department member said ...esday, "but the closer their crap is to where it's being treated, the better."

As development continues to surge, smaller-scale solutions for clusters of homes, using innovative technologies to eliminate nitrogen that otherwise damages the Cape's streams and bays, will become increasingly important.

Heufelder spoke at the organizational meeting of the Cape Cod Wastewater Implementation Committee, appointed by the county commissioners to allow town health officials to share information and work toward comprehensive regional approaches to wastewater management.

John O'Brien, former CEO of the Cape Cod Chamber, said the steps necessary to manage wastewater and protect the region's water quality could require a 30-year scheme and cost a billion dollars.

"The solution may be to allow the county government to bond," he said in calling for a regional authority that could raise the mer...

Continued on page 12

County wastewater board seeks regional answers...

Continued from page 1

essary funds and also monitor performance of the innovative systems being introduced on the Cape.

O'Brien was blunt about the gap between towns' capital needs and their ability to raise funds to meet them. He said dedicated increases in the rooms and sales taxes might be one avenue of assistance.

"We need one overriding organization that promotes wastewater management throughout the Cape," said Dr. James Taylor, a member of the Eastham Board of Health.

Tom Cambareri of the Cape Cod Commission, who chaired the meeting, said the committee would help identify water flow patterns and create a matrix of areas of sensitivity to wastewater. Also, the group will look at sites for community and wastewater discharge locations with the goal of studying one or more model wastewater management districts.

"We've really reached the point on the Cape where we will not be able to continue to rely on on-site systems," said Margo Fenn, executive director of the Cape Cod Commission. "On issues of infrastructure, wastewater is at the top of the list. It's the biggest planning issue we'll have on Cape for the next years."

Working together will take some adjusting, Heufelder admitted.

"We're all damn Yankees," he said. "We don't like to be joined to anyone at the hip."

Letters to the Editor

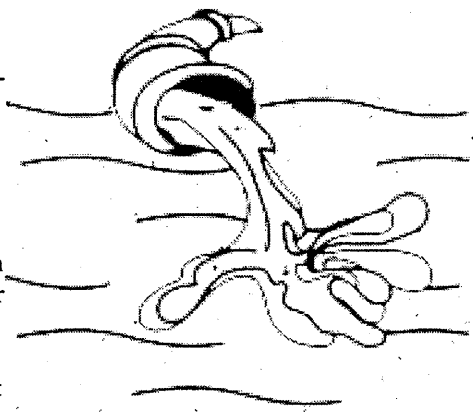
The Barnstable Patriot welcomes letters to the editor. Please keep them brief (250 word limit) and either type or print them neatly. The Barnstable Patriot, P.O. Box 1208, Hyannis, MA 02601 or E-mail to letters@barnstablepatriot.com.

CAPE COD COMMISSION
REPORTER
November 7, 2002 Volume 12, Number 21
The newsletter of the regional planning and regulatory agency serving Barnstable County since 1990.

County Wastewater Committee Moves Ahead

Barnstable County's Wastewater Implementation Committee, formed in May 2002 with representatives from each Cape town and several federal, state, and regional agencies, has begun to move forward on wastewater management and implementation issues after taking a few months to work through organizational matters and to clarify the committee's mission and objectives. Chaired by Cape Cod Commission Water Resources Program Manager Tom Cambareri in cooperation with Barnstable County Department of Health and Environment Director George Heufelder, the group will meet monthly to advise the county on regional and local wastewater management and related infrastructure issues.

At its October 29th meeting, the committee heard a report from Maggie Geist, executive director of the Association to Preserve Cape Cod (APCC), on the APCC Business Roundtable's county grant initiative to explore ways to fund wastewater implementation measures. Geist explained that, through a Request for Proposals (RFP) process, the Business Roundtable has selected a pair of consultants to look at "the money part" of regional and other approaches. She said the effort will result in a white paper, possibly followed by an assessment of needed political measures.



The committee also heard from State Senator Rob O'Leary on his preliminary ideas for a legislative initiative aimed at developing support for Cape communities as they struggle to fund needed wastewater infrastructure. O'Leary brainstormed with the committee on financial and organizational possibilities and potential state, regional, and local incentives. All present agreed on the importance of a "bottom's up" approach with a high degree of local involvement and public participation. The committee was also enthusiastic about pursuing wastewater measures on the Cape on a watershed basis.

Following that lively discussion, the committee reviewed and approved its mission statement:

"The Wastewater Implementation Committee (WIC) is an advisory committee to Barnstable County. The committee is to serve as a regional forum on wastewater issues for sharing information and coordination between towns, the county, and state programs, and providing local and regional input towards consensus building and developing a new regional wastewater management plan. The WIC is embarking on an ambitious agenda to facilitate and encourage towns to initiate wastewater management strategies that protect public health, restore coastal and fresh surface water quality, preserve community character, and provide growth center infrastructure. The WIC's goal is to address these wastewater issues in a manner that incorporates good science, appropriate technologies, and acceptable legal and financial means of implementation."

...to page 2

• INSIDE •

Wastewater, from page 1...

An important component of the new project will be data collection and analysis. The Commission will work with local, county, and state agencies to compile and analyze existing data, maps, and projections of wastewater flows. A major effort will be to identify potential wastewater discharge locations across the region. The project will also investigate the legal, financial, and regulatory considerations for wastewater management districts on Cape Cod. Outreach and education activities throughout the project will help facilitate community involvement and interest in regional wastewater planning and implementation.

Fenn notes that the project will dovetail nicely with the Commission's proposal to develop a Regional Infrastructure and Facilities Plan as part of the 2001 Regional Policy Plan. The effort will also complement the Commission's ongoing studies of the water quality of Cape Cod's 47 coastal embayments and nearly 400 ponds and lakes.

"Wastewater facility planning for the future must recognize Cape Cod's economic growth and also protect sensitive areas and resources from impacts," she explains. "It must also capitalize on our regional ability to solve problems."

Cambareri agrees, adding: "The time has come for Cape Cod to begin the transition from a wastewater infrastructure dominated by septic systems to one that provides opportunities for a higher level of wastewater treatment where it is needed."

For more information about the State Revolving Loan Fund, check the Department of Environmental Protection's Web site: **www.state.ma.us/dep/brp/mf/mfhome.htm**

For more information about the Cape Cod Commission's new regional wastewater management strategy grant, contact Cambareri at the Commission's office; phone (508) 362-3828 extension 318, or e-mail *water@capecodcommission.org*.

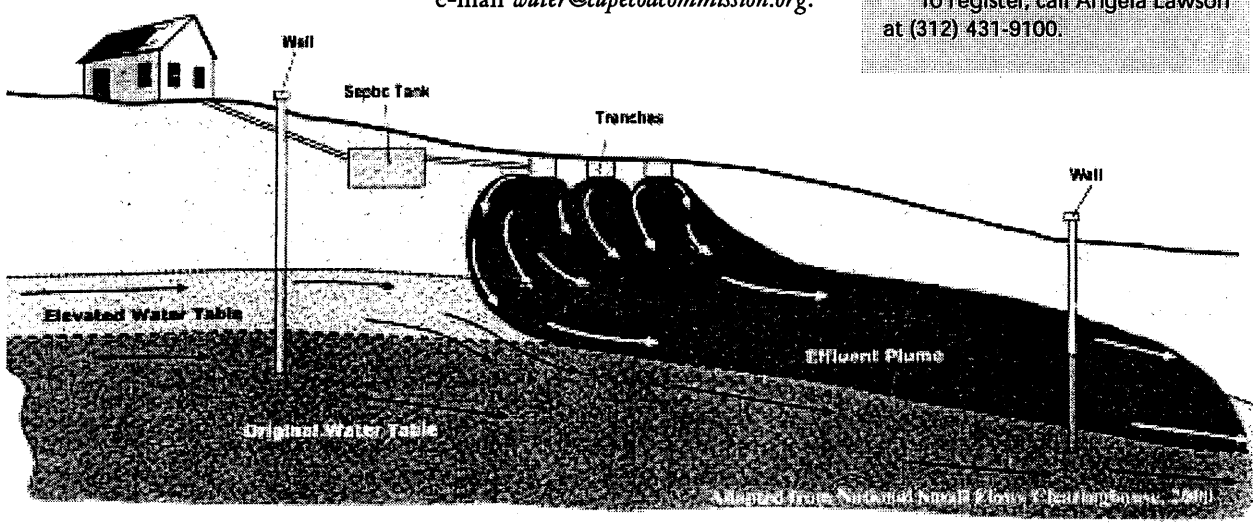
Audio Conference Series for Planners and Others

The American Planning Association (APA) and the Lincoln Institute of Land Policy will present a series of audio conference training programs on community planning. The audio conference is delivered live over a speaker telephone to any group, once registered. Presenters include elected and appointed officials, planning directors, and staff, land use and municipal attorneys, planning consultants, policy researchers, and academic researchers. Upcoming programs include:

- **Teardowns, Monster Homes, and Appropriate Infill** – December 5, 2001, from 4 to 5 p.m.
- **Context-Sensitive Signs** — February 6, 2002, from 4 to 5 p.m.
- **Preserving Community Retail** — May 22, 2002, from 4 to 5 p.m.

For more information, check the Web: **www.planning.org/educ/audiocon.htm.**

To register, call Angela Lawson at (312) 431-9100.



CAPE COD COMMISSION
REPORTER
November 22, 2001 Volume 11, Number 22
The newsletter of the regional planning and regulatory agency serving Barnstable County since 1990.

New Grant to Help Develop a Regional Wastewater Management Strategy

The Cape Cod Commission recently learned that it is slated to receive a $50,000 grant to develop a comprehensive regional wastewater management strategy for Cape Cod. The two-year project is one of only 16 statewide to receive funding this year from the Massachusetts Watershed Initiative Priority Projects Grant Program of the Executive Office of Environmental Affairs.

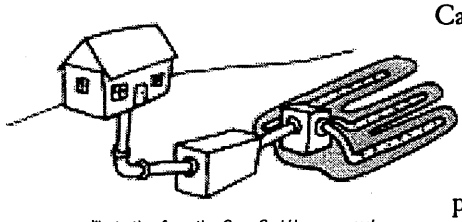


Illustration from the *Cape Cod Homeowners' Guide to Title 5* by APCC, copyright © 1999.

"We are pleased to secure funding for this project," notes Cape Cod Commission Executive Director Margo Fenn. "It's clear that the Massachusetts Watershed Initiative recognizes the need for a regional approach to help Cape communities engaged in wastewater planning."

According to Commission Water Resources Program Manager Tom Cambareri, the last time Cape Cod took a regional look at wastewater management was 20 years ago under an area-wide water quality/wastewater plan under the federal Clean Water Act. That effort concluded that septic systems would be adequate to accommodate Cape Cod's growth for 20 years. "Given the Cape's population growth over the last two decades, we need a new regional consensus to manage wastewater and address degraded water quality," Cambareri says.

The goals of the newly funded project are:

- to provide a regional context for wastewater management solutions;
- to compile information and provide technical assistance to towns;
- to screen land uses and identify potential sites for wastewater treatment and disposal;
- to conduct a case study and develop a model wastewater management district with legal and financial mechanisms for implementation; and
- to provide opportunities for Cape Cod towns to share information as they devise their wastewater plans.

The effort will begin with the creation of a Cape Cod Wastewater Implementation Committee representing each town and the region. The committee will work with the state Department of Environmental Protection to assist in developing local or regional applications to the State Revolving Fund, which provides low-cost loans for wastewater treatment. The committee will also review comprehensive wastewater assessments and management planning.

...to page 2

•INSIDE•

Wastewater, from page 1...

The committee's major work will be information assessment, investigation of options for the formation of wastewater management districts, outreach, technology assessments, and investigation of options for financing.

According to Cambareri, Barnstable County will soon issue a Request for Proposals for consulting help specifically to assist in evaluating options for establishing wastewater management districts and, through the use of several case studies, to recommend "pathways to local implementation." Cambareri notes that Barnstable County will coordinate this RFP project with APCC's.

The committee has compiled several matrices of local wastewater management issues and information on sensitive water resources and wastewater facility siting. The matrices summarize population, local governance, existing facilities, planning measures, whether or not Title 5 septic problems exist, and whether ponds, coastal embayments, and drinking water quality is impaired by wastewater disposal practices. The committee will use this information as background and will meet again later this fall to discuss its next steps. For information, contact Tom Cambareri at (508) 362-3828, or George Heufelder at (508) 375-6613.

USGS Observation Well Data

The groundwater-level measurements shown below are taken monthly by the Cape Cod Commission's Water Resources Office from nine United States Geological Survey (USGS) index wells. The data are compiled during the last week of each month and are published here and on the Web (**www.capecodcommission.org/wells.htm**) as soon as possible thereafter. For more information about groundwater levels, please contact Cape Cod Commission Hydrologist Gabrielle Belfit.

October 2002

Location	Well Number	Level*	Record High*	Record Low*	Departure from Average**	
					Monthly	Overall
Barnstable	A1W 230	26.3	20.5	26.6	-1.8	-2.7
Barnstable	A1W 247	27.4	20.5	28.6	-2.3	-2.9
Brewster	BMW 21	13.6[†¶]	6.9	13.6[¶]	-3.0	-3.4
Chatham	CGW 138	25.6	20.9	26.6	-0.9	-1.6
Mashpee	MIW 29	9.9	5.6	10.0	-0.6	-1.3
Sandwich	SDW 252	48.0	45.9	48.2	-0.4	-0.7
Sandwich	SDW 253	54.7[†]	45.8	55.1	-4.2	-4.6
Truro	TSW 89	12.5	10.2	13.0	-0.1	-0.4
Wellfleet	WNW 17	12.4	7.3	12.8	-1.4	-2.0

*Feet below land surface. **Feet above mean sea level. [†]New monthly low. [¶]New record low.

Plan Now for Maritime Days 2003

Planning for the tenth annual Cape Cod Maritime Days has begun! The nine-day event will take place from **Saturday, May 10, through Sunday, May 18, 2003.** Planned activities will include lighthouse tours, museum exhibits, historic walking tours, demonstrations, lectures, cruises, and classic maritime movies.

Special events during Maritime Days will be the seventh annual Cape Cod Maritime History Symposium all day on Saturday, May 10, in Hyannis. Also on that day, the second annual Maritime Festival at Aselton Park in Hyannis will feature boat builders, crafts, food booths, and entertainment.

During the weekend of May 16, 17, and 18, the Goose Hummock Outdoor Center will offer "Coastal Waters 2003: A Kayaking Experience," which will include a symposium/lecture series as well as events, workshops, and tours.

Maritime Days is sponsored by the Arts Foundation of Cape Cod and the Cape Cod Commission. The Town of Barnstable will provide support for the Maritime Festival. A brochure of events will be available in April 2003, and all events will be listed on the Heritage Discovery Network web site: **www.capecodcommission.org/hdn**

5/26/2003 **WASTEWATER IMPLEMENTATION COMMITTEE** **APPENDIX B**

Chairperson: Augusta McKusick

Vice-Chair: Frank Sampson

Town Members	Name	Address	Town	
Barnstable	Mark Ells	DPW Town Hall Main St	Hyannis	MA 02601
Alternate	Mark Giardono	DPW Town Hall Main St	Hyannis	MA 02601
Bourne	John R. Elwood	305 County Road	Bourne	MA 02532
Brewster	Raqual Ellis	651 Thousand Oaks Dr	Brewster	MA 02631
Alternate	Nancy Ice	Town Hall Route 6A	Brewster	MA 02631
Chatham	John V. Payson	P. O. Box 270	West Chath	MA 02669
Dennis	Curt Livingston	PO Box 1503	Dennisport	MA 02639
Eastham	Dr. James Z. Taylor	P.O Box 1601	No. Easthan	MA 02651
Falmouth	John Waterbury	PO Box 672	Woods Hol	MA 02543
Harwich	Frank Sampson	109 Riverside Dr	West Harwi	MA 02671
Alternate	Paula Champagne	Town Hall, Board of Health	Harwich	MA 02456
Mashpee	Tom Fudala	Town Hall, Planning Dept.	Mashpee	MA 02649
Orleans	Augusta McKusick	PO Box 548	South Orlea	MA 02662
no-Ptown				
Sandwich	David B. Mason	16 Jan Sebastian Drive	Sandwich	MA 02563
Truro	Gary Palmer	Town Hall P.O. Box 2030	Truro	MA 02666
Wellfleet	Emily Beebe	Town Hall, 300 Main St.	Wellfleet	MA 02667
Yarmouth	George Allaire	Yarmouth Town Hall 1146 Route 28	So. Yarmou	MA 02664

AGENCIES

Commissioners	William Doherty	Superior Court House	Barnstable	MA 02630
Assembly	John Hodgkinson	53 Samoset Rd	Orleans	MA 02663
BCDHE	George Heufelder	BCDHE Superior Court House	Barnstable	MA 02630
CC Chamber	John D. O'Brien	P. O. Box 790	Hyannis	MA 02601
CCC	Tom Cambareri	CCCommission 3225 Main St	Barnstable	MA 20630
Alternate	Ed Eichner	CCCommission 3225 Main St	Barnstable	MA 20630
DEP	Brian A. Dudley	DEP-SERO Riverview Dr.	Lakeville	MA 02347
WBNERR	Vacant	P.O. Box 3092	Waquoit	MA 02536

Town Matrix of Wastewater Planning
Status and Local Concerns

APPENDIX C

Town	Population		Villages	Title 5 Problems	Waste Water Management Need	Impaired Water Qualit		
	Summer	Year Round				Ponds	Embayments	
Barnstable	120000	47821	7	Yes	Yes	N,B,Y	N,B,Y	
Bourne	41000	18721	9	Upgrades	No	N,Y	N,Y	
Brewster	27000	10580	0	Upgrades	No	N,B,Y		
Chatham	25000	6625		Yes	Yes	N,B,Y	N,B,Y	
Dennis	15973	13864	5	Yes	Yes	N,B,S,Y	B,S,Y	
Eastham	7500	5000		Yes		N,Y	B,HM,S,Y	
Falmouth	90000	32700		Yes	Yes	map?	map?	
Harwich	25000	12946	1	Yes	Yes	N,B,Y	N,B,Y	
Mashpee	29000	14000				HM,B,Y	N,B,Y	
Orleans	21000	7000	4	Yes	Yes	N,Y, Birds	N,Y	
Provincetown								
Sandwich		21257	3	Yes	Yes			
Truro		2087						
Wellfleet	17500	3184		Yes	Yes			
Yarmouth	60000	25000		Yes				

Key: 1) Nutrients (N) Bacteria (B) HazMats (HM) Septic (S)
2) Monitoring (Y)

Town Matrix of Wastewater Planning
Status and Local Concerns

APPENDIX C

Town	Government:			Wastewater Facility:				
	Wastewater Committee	Water Quality Committee	Water Sampling Committee	Exisiting WW Facility	Town Subsidized	Enterprise account	District	Operator
Barnstable	Nutrient Management Team (DPW, Planning, Health, DEP, CCC, ConCom, Engr, Three Bays)			Y	Y	Y	N	DPW, Water Pollution Control Division
Bourne	No	Pollution Task Force	Collalition for Buzzards Bay	N				
Brewster	No	Yes	Yes, Ponds	Orleans	Y	Y	Y	Tri-Town
Chatham	Yes	No	No, Water Quality Lab	Y	Y	N	N	Bill Redfield/ Earth Tec
Dennis	No	Yes	Water Quality Committee	D/Y septage	Y	N	N	
Eastham	BOH	BOH	WRAB	N				
Falmouth				Y	Y		Y	DPW
Harwich	No	Yes	Part of Water Quality Committee	N				
Mashpee	Sewer Commission	No	No	6 Private				Private
Orleans	Wastewater Mgt Steering Committee	Water Quality Task Force		Tri-Town			Y	Tri-Town
Provincetown								
Sandwich	No	No	No	N				
Truro	No	Forming	BOH	N				
Wellfleet	BOH	No	No	N				
Yarmouth	Integrated Water Resource Planning Committee			D/Y septage		Y		Aquasource

Key: 1) Nutrients (N) Bacteria (B) HazMats (HM) Septic (S)
2) Monitoring (Y)

Town Matrix of Wastewater Planning
Status and Local Concerns

APPENDIX C

Town	Ongoing Facility Planning	Citizens Advisory Committee	Comprehensive Water Planning:						
			Facility Planning Engineer:			Facility Planning Focus			
			Name	Years	Manager	Upgrade	Compre-hensive	Water Quality	Infra tu
Barnstable	Y	Y	Sterns & Wheler, LLC	1993	Mark Giordano/ John Jacobson	Y	Y	Y	`
Bourne	N	N							
Brewster	N	N							
Chatham	Y	Y	Sterns & Wheler, LLC	1998	Robert Duncanson	Y	Y	Y	`
Dennis	Y	Y				Y		Y	Y/
Eastham	N	N							
Falmouth	Y	Y				Y		Y	`
Harwich	N	N							
Mashpee	Y	Y	Sterns & Wheler, LLC	1999	Sewer Commission		Y		
Orleans	Y	Y	Wright Pierce	1999	Mike Giggey	Y	Y	Y	`
Provincetown									
Sandwich	N	N							
Truro	N	N							
Wellfleet	N	N							
Yarmouth	N	Y	Camp Dresser & McKee	2002					

Key: 1) Nutrients (N) Bacteria (B) HazMats (HM) Septic (S)
2) Monitoring (Y)

Town Matrix of Wastewater Planning
Status and Local Concerns

APPENDIX C

Town	Comprehensive Water Planning (cont):					
	Wastewater Planning Concerns				Creating Wastewater Districts	
	Water Quality	Public Health	Community Character	Economic Development	District Identification	Objective of Wastewater Districts
Barnstable	Y	Y	Y	Y	Evaluating	Assess WW needs, constuction, operation, mainter education and public participation
Bourne	2	1	4	3	NO	
Brewster	Y				No	Wastewater nutrient reduction
Chatham	Y	Y	Y	Y	Evaluating	Nutrient Reduction, IA systems, O & M, Public
Dennis	Y	Y	Y	N	Y	Treat septic system effluent to protect water qua
Eastham	Y					
Falmouth	Y		Y	Y	N	
Harwich	Y			Y	N	
Mashpee	Y				Evaluating	
Orleans	Y	Y	Y	Y	Evaluating	create district for each sub groundwater basir
Provincetown						
Sandwich	Y	Y	Y	Y	Evaluating	O&M to ensure protection of resources and public
Truro	Y	Y		Y		
Wellfleet	Y	Y	Y		Evaluating	Nutrient reduction in central district, monitor IA sy
Yarmouth						

Key: 1) Nutrients (N) Bacteria (B) HazMats (HM) Septic (S)
2) Monitoring (Y)

Appendix D

Barnstable County Wastewater Implementation Committee 6/20/02

Wastewater Facility Planning Process

1 **Locals identify problem**
- Title 5 – Public Health
- Community Character
- Water Quality – MEP
  - Monitoring 3 years
  - Linked Study
  - Thresholds and preliminary analysis
- Economic Development

2 Locals form working group – Hire consultant to assist in planning and scoping
- Input from DEP, MEPA, CCC

3a Submit ENF on scope of work (The MEPA process)

3b Submit Clean Water State Revolving Fund (SRF)Application
- Comprehensive study
- Construction or Upgrade

4 Town Meeting Appropriation of local funds

5 MEPA Certificate on Scope of Work and Begin Comprehensive Study
- Form a CAC
- Needs Assessment
- Alternative Screening
- Detailed Alternative Analysis
  - Technical, Environmental, Institutional and Financial
- Selection of preferred Alternative(s)

5 Submit DEIR

6 Respond to DEIR certificate and submit FEIR

7 Submit Clean Water SRF

8 Town Meeting Appropriation.
- Yes-construct
- No –return to beginning

References:

Final Facilities Planning Guidance: Materials to assist officials, consulting engineers, citizen groups and other interested parties in developing wastewater management plan http://www.state.ma.us/dep/brp/mf/othergrt.htm
Clean Water State Revolving Fund Program
http://www.state.ma.us/dep/brp/mf/cwsrf.htm

A Framework for Site Evaluation, Design, and Engineering of On-Site Technologies Within a Management Context.
This guidance provides an approach for the use and management of decentralized on-site systems for Massachusetts communities. The document describes a logical process for incorporating treatment performance standards into the Massachusetts on-site program on a watershed by watershed basis. By Michael T. Hoover, 1997. http://www.state.ma.us/dep/brp/wwm/t5pubs.htm

A Massachusetts Guide to Needs Assessment and Evaluation of Decentralized Wastewater Alternatives.
This publication explains the environmental, regulatory, geographic, demographic, and technological variables that arise when considering decentralized wastewater management as an alternative to constructing a central facility. By Andrea L. Arenovski and Frank C. Shepard, 1996. http://www.state.ma.us/dep/brp/wwm/t5pubs.htm

Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach.
The report considers the kinds of administrative, regulatory, and financial systems that other states have created to manage on-site wastewater systems. By Frank C. Shepard, 1996. It is a companion to the Needs Assessment document above. http://www.state.ma.us/dep/brp/wwm/t5pubs.htm

Accountability: Issues of Compliance with Decentralized Wastewater Management Goals An analysis of the accountability issues in decentralized wastewater treatment for federal, state, and local regulators and officials, as well as academic and professional communities concerned about reform in goals practices. By Valerie I. Nelson and Frank C. Shepard, 1998. This document is a companion to the above listed documents:plan.zip and mgmt.zip. http://www.state.ma.us/dep/brp/wwm/t5pubs.htm

Interim Guidelines on Reclaimed Water Policy # BRP/DWM/PeP-P00-3. January 2000

December 9, 2002 **APPENDIX E**

DRAFT OUTLINE

Wastewater Management Plan for Cape Cod

Objectives: To articulate regional wastewater needs and identify major policy issues and resource needs to develop recommendations to capitalize on regional solutions.

Overview: An up-to-date assessment of Cape Cod's wastewater needs, technology, and regulatory process, coupled with an exploration of alternatives and actions to resolve legal and institutional hurdles.

Environmental Assessment
- Drinking water supply
- Coastal Embayments
- Fresh water ponds

Infrastructure Needs Assessment
- Resource Protection
- Resource Restoration
- Economic Sustainability

Technology Assessment
- Wastewater treatment
  - On-site Systems
  - Alternative On-site Systems
  - Package Treatment Plants
  - Wastewater Treatment Plants
- Septage Treatment

Regulatory Process and Funding
- Facility Planning
  - MEPA
  - DRI
- Alternative On-site Permitting
- Groundwater Discharge and Title 5 Permit Gap
- SRF

Exploration of Alternatives – By Town/Resource/Growth Center
- No Action
- Preventive
- Restoration I – Decentralized
- Restoration II – Collection and Treatment
- Growth Center – Collection and Treatment
- Cost Estimates

Recommended Management Program for Cape Cod
- Local Actions
- County Actions
- Wastewater Management Districts

APPENDIX F

DELIVERABLE → WIC Map I, ***"Water Resources of Cape Cod"***

Description:

This map portrays a combination of information on regional water resources from Cape Cod Water Resources Classification Maps I and II that were adopted as a part of the Cape Cod Regional Policy Plan on April 29, 2002. Specifically, the map displays Cape Cod's major roads, municipal boundaries, water bodies, public supply wells, small volume wells, and Primary Resource Areas. Primary Resource Areas include Identified Wellhead Protection Areas (Zone II's), Identified Freshwater Recharge Areas, Potential Public Supply Areas, and Marine Water Recharge Areas. Marine Water Recharge Areas are further classified into Major Systems and Sub-systems.

This map and all data layers were created with the Arc/Info (v. 8.2.0) GIS software.

Projection information for all map data layers:

- Projected coordinate system name: NAD 1983, units = meters, State Plane Massachusetts Mainland Zone, FIPS 2001.
- Geographic coordinate system: GCS, North American, 1983.

Source information for map data layers:

- Public Supply Wells: USGS, CCAMP1988, with updates by CCC to September 2001 from town water departments.
- Small Volume Wells: Property locations with small volume wells were matched with digitized parcel locations in order to determine the geographic location of these wells. Wells include public water supplies which are likely to serve 25 or more persons per day for more than 60 days per year.
- Identified Wellhead Protection Areas (Zone II): CCC Water Resources Office updates to 2001, which include various private consulting firms and DEP.
- Freshwater Recharge Areas: Areas shown are those identified TO DATE by CCC Water Resources Office staff and private consultants, 2002.
- Potential Public Water Supply Areas: From the "Priority Land Acquisition Assessment Project," June 1999; from the Lower Cape Water Management Task Force, 1988; from various other CCC Water Resources Office projects; and from USGS GIS analysis "Water Resources Investigations Report 94-4156, 1994," Harris and Steeves.
- Marine Water Recharge Areas: Delineated by CCC Water Resources Office under the Cape Cod Coastal Embayment Project. (See Technical Memorandum: Nitrogen Sensitivity and Prioritization of Cape Cod Embayments, August, 1996 for more details.
- Basemap Features: MassGIS, 1988, from 1:25000 scale USGS Quadrangle sheets; late 1970s and earlier 1:100000 scale maps. Includes ponds, roads, coastline, town boundaries.

Data access:

Inquiries and comments about data sources and map display properties are welcome at the Cape Cod Commission Water Resources Office.

APPENDIX F

DELIVERABLE → WIC Map II, ***"Threats to Water Resources from Development"***

Description:

The map "Threats to Water Resources From Development" highlights density in residential areas by displaying them in a red gradient color ramp. Darker red colors denote higher residential density. Regional commercial and industrial centers are also visible. Wastewater flows from these densely developed areas and economic growth centers can be visually inferred from the display properties of the map. Other sites directly impacting regional groundwater quality are also displayed including wastewater treatment facilities, waste disposal and hazardous waste sites, and state-registered (DEP) groundwater discharge permit sites. Suspected groundwater pollution plumes from these sites are displayed where available. Regional base map features include major roads, municipal boundaries, and water bodies.

This map and all data layers were created with the Arc/Info (v. 8.2.0) GIS software.

Projection information for all map data layers:

- Projected coordinate system name: NAD 1983, units = meters, State Plane Massachusetts Mainland Zone, FIPS 2001.
- Geographic coordinate system: GCS, North American, 1983.

Source information for map data layers:

- Land Use (incl. Wastewater Treatment Facilities, Waste Disposal / Hazardous Waste Sites, Residential, Commercial, and Industrial land use classes): MacConnell categories digitized from aerial photo interpretation by the Resource Mapping and Land Information Systems Dept. of Forestry and Wildlife Management, UMass Amherst, in cooperation with the EOEA MassGIS project and the Cape Cod Commission. Further information on the land use categories may be found in the publication "Remote Sensing and 20 Years of Change in Barnstable, Dukes, and Nantucket Counties, Massachusetts, 1951-1971," W. MacConnell, UMass.
- Plumes: Various scales, various private consulting firms, HAZWRAP, CCC Water Resources Office Staff, to August 2001.
- Basemap Features: MassGIS, 1988, from 1:25000 scale USGS Quadrangle sheets; late 1970s and earlier 1:100000 scale maps. Includes ponds, roads, coastline, town boundaries.

Data access:

Inquiries and comments about data sources and map display properties are welcome at the Cape Cod Commission Water Resources Office.

APPENDIX F

DELIVERABLE → WIC Map III, "*Wastewater Facility / Disposal Areas Constraints"*

Description:

The map "Wastewater Facility / Disposal Areas Constraints" indicates general areas that would impede the development of a new wastewater treatment facility (WWTF). The display order is as

Protected and recreational open space
- High groundwater areas (<15 ft. from surface)
- Wetlands
- The Massachusetts Military Reservation (including the boundary of the MMR Groundwater Protection Zone)
- The Cape Cod National Seashore
- Existing residential areas
- Existing wastewater treatment facilities
- 400 ft. buffer regions of public drinking water supply wells
- 300 ft. buffer regions of small volume wells
- Identified wellhead protection areas (Zone IIs)

This map and all data layers were created with the Arc/Info (v. 8.2.0) GIS software.

Projection information for all map data layers:
- Projected coordinate system name: NAD 1983, units = meters, State Plane Massachusetts Mainland Zone, FIPS 2001.
- Geographic coordinate system: GCS, North American, 1983.

Source information for map data layers:
- Groundwater Discharge Permit Sites: Determined by the MA DEP Division of Watershed Management, 2002.
- Identified Wellhead Protection Areas (Zone II): CCC Water Resources Office updates to 2001, which include various private consulting firms and DEP.
- Protected and Recreational Open Space: Compiled by CCC GIS Staff from various federal, state, and local agencies to 2003.
- Public Supply Wells: USGS, CCAMP1988, with updates by CCC to September 2001 from town water departments.
- Small Volume Wells: Property locations with small volume wells were matched with digitized parcel locations in order to determine the geographic location of these wells. Wells include public water supplies which are likely to serve 25 or more persons per day for more than 60 days per year.
- Residential Lands / Wastewater Treatment Facilities: Digitized from aerial photo interpretation by the Resource Mapping and Land Information Systems Dept. of Forestry and Wildlife Management, UMass Amherst, in coordination with the EOEA MassGIS project and the Cape Cod Commission.
- Wetlands: 1999 DEP Wetlands Conservancy Program.
- High Groundwater Areas: Delineated from USGS depth to groundwater modeling effort (1996).
- All other basemap features were digitized by the Cape Cod Commission GIS Staff using the ARC/INFO GIS software.

Data access:

Inquiries and comments about data sources and map display properties are welcome at the Cape Cod Commission Water Resources Office.